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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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78-0713. Weber, J. B. (North Carolina State Univ., Raleigh, NC 27607) **The pesticide scorecard.** *Environ. Sci. Technol.* 11(8): 756-761; 1977.

A quantitative comparison is made of the properties and behavior of some of the old versus some of the new pesticides. To gain a better understanding of the relative safety of pesticides to man and the environment, one needs to have a general idea of the kinds of toxicological tests that are used to measure the safety of pesticides; the fate of pesticides in the environment; and a scheme that allows one to compare the relative properties of one pesticide with another. The fate of pesticides in the environment is considered along with toxicity, longevity, and bioaccumulation of various pesticides.

78-0714. Earnest, C. M. ; McCown, S. M. (Northeast Louisiana Univ., Monroe, LA 71203) **Pesticides. [Letter to the Editor]** *Environ. Sci. Technol.* 11(12): 1042; 1977.

A letter in response to and disagreement with an article, "The Pesticide Scorecard", appearing in the August 1977 issue of Environmental Science and Technology is presented. The main point of contention is the opinion presented in the August issue that pesticides can be classified into four groups based on their bioaccumulation factors, and that pesticides which have factors of 8000 or more are not excreted or metabolized to an appreciable extent. The authors of the letter cite numerous sources in the literature as well as their own experience to support their contention that no general statement of the bioaccumulation of pesticides by freshwater fauna can be made based on present data.

78-0715. Weber, J. B. (North Carolina State Univ., Raleigh, NC 27607) **Pesticide scorecard. [Letter to the Editor]** *Environ. Sci. Technol.* 11(13): 1138; 1977.

This letter to the editor is in reply to a previous letter regarding an article entitled "The Pesticide Scorecard". Three major points are made in this reply. First, the use of the terminology concerning pesticides as highly accumulative may have been a little strong. Second for DDT and some other pesticides, an equilibrium does become established between certain organisms and the DDT concentrations with which they are in contact. Third, the original paper was not intended to cover the entire pesticide field. Much more research is needed in this area of bioaccumulation and biomagnification of pesticides.

78-0716. Shevchenko, M. G. ; Kryzhanovskaia, M. V.; Buryi, V. S.; Klisenko, M. A.; Antonovich, E. A. (USSR Ministry of Public Health, Moscow, USSR) **K razrabotke edinoi avtomatizirovannoi sistemy kontrolia ostatochnykh kolichestv pestitsidov v stranakh - chlenakh SEV. [A standardized automated monitoring method for pesticide residues in Comecon member countries.]** *Gig. Sanit.* (7): 91-93; 1977. (Russian)

A unified automated, computerized monitoring and information system is being developed in the Comecon countries for monitoring pesticide residues in the environment and food. The program includes the development of unified terminology, unified sampling and analytical methods and instruments, and a central data processing and retrieval system. New developments will include the combination of gas chromatography with mass spectrometry and computers.

78-0717. Ahmed, M. Y. Y. ; Brower, J. H.; Tilton, E. W. (Radiobiol. Dep., At. Energy Establ., Cairo, Egypt) **Sterilization of 4-5-day-old pupae of the Indian meal moth with gamma radiation and its effect on mating competitiveness.** *Int. J. Appl. Radiat. Isot.* 29(1): 55-57; 1978. (9 references)

Releasing insects sterilized by ionizing radiation is a possible method for reducing usage of chemical pesticides. Indian meal moths were irradiated as 4-5 day old pupae with an absorbed dose of 35 krad of gamma radiation. This treatment completely sterilized female moths and partially sterilized male moths. When irradiated male moths were paired with unirradiated female moths, only 19.1% of the eggs hatched. When irradiated males, unirradiated males, and unirradiated females were confined together at ratios of 1:1:1, 5:1:1, 10:1:1, 15:1:1, and 25:1:1, 18.2%, 48.7%, 46.6%, 47.7%, and 58.9%, respectively, of the eggs were infertile. When irradiated females, unirradiated females, and irradiated males were confined in these same ratios, 15.6%, 66.2%, 74.3%, 100.0%, and 100.0%, respectively, of the eggs were infertile.

78-0718. Semenov, V. A. ; Simonov, V. D. (Ufa Branch, All-Union Scientific Research Institute of Plant Protection Agents, Ufa, USSR) **Primenenie prognozirovaniia dlia napravlennogo poiska pestitsidov. [Use of the prediction method for the directed search for new pesticides.]** *Khim. Sel'sk. Khoz.* (11): 38-44; 1977. (11 references) (Russian)

A computerized method of searching for potential pesticides and predicting their properties is described. The method includes the construction of potentially active structures in homologous series on the basis of data on the properties and modifying effects of structural elements (fragments, groups, radicals), the construction of pesticide mixtures, and the selection of compounds with the necessary pesticidal properties and acceptable toxicological characteristics among known compounds on the basis of relationships between the IR spectrum and the characteristics of a large number of compounds. The method is suitable for the prediction of the toxicity of chemical compounds on the basis of their IR spectra or of that of compounds with known toxicity that are most similar to them. Preliminary investigations covering 2,000 compounds revealed agreement between the experimentally determined and computed toxicity class (LD_{50} under or over 1,000 mg/kg) of 70±10% of all compounds.

78-0719. Lynch, M. P. (Dep. Environ. Physiol., Virginia Inst. Mar. Sci., Gloucester Point, VA 23062) **The use of physiological indicators of stress in marine invertebrates as a tool for marine pollution monitoring.** *Natl. Tech. Inform. Serv.* COM-75-10699; 13 p.; 1977. (17 references)

Present techniques for monitoring pollution in aquatic environments rely heavily upon measuring the concentration of a given pollutant. In marine environments, because of the possibility of synergistic effects brought about by the ionic composition of the medium, physiological criteria would be a much more sensitive measure of pollution effects than a determination of the pollutant itself. Selected serum constituents of the blue crab, *Callinectes sapidus*, subjected to natural stresses (red tide and holding) and pollution related stresses (DDT and thermal shock) were compared to "baseline" concentrations of the same constituents in crabs from unstressed environments. Glucose in new year class females and serum protein in both males and females were higher in red tide stressed crabs. Protein and total osmotic concentration were lower in DDT stressed crabs. Thermal stress resulted in higher total ninhydrin positive substances, total osmotic concentration and glucose and lower chloride in female crabs. Comparing serum constituents of animals offers promise as a tool for assessing the effects of pollutants on marine animals and for monitoring pollution effects in natural environments. (Modified author abstract by permission)

78-0720. Eckholm, E. ; Scherr, S. J. (Worldwatch Inst., Washington, DC) **Double standards and the pesticide trade.** *New Sci.* 77(1090): 441-443; 1978.

Legislation is being considered in the US Congress that will impose some minimal regulation on the export of pesticides. This will be a small but significant blow against the double standard that permeates the health and environmental protection laws of most countries. Some developing countries have enacted virtually no legislation to govern the importation, registration, and handling of pesticides, and few maintain any facilities for monitoring pesticide residues in food or the environment. These attitudes help explain the high, though not well documented, incidence of poisonings among farm workers, especially those who apply pesticides. Specific problems which have arisen in various developing countries as a result of the unrestricted employment of pesticides are briefly reviewed.

78-0721. Bradbury, F. R. ; Loasby, B. J. (Univ. Stirling, Stirling, Scotland) **Cost-benefit analysis and investment appraisal in relation to pest control measures.** *Pestic. Sci.* 8(4): 366-376; 1977. (17 references)

A distinction is drawn between cost-benefit analysis and investment appraisal. Both are methods for evaluating projects, with cost-benefit analysis looking at proposals from the angle of the larger community in contrast to investment appraisal which looks at them from the individual, or firm, point of view. The time value of money is examined and also the treatment by cost-benefit analysis of social values and other elements outside the purview of investment appraisal, the so-called externalities or spillovers. Cost-benefit analysis of pest control measures is shown to depend heavily on analysis of the complexities and interactions of the biological/biochemical systems involved. This leads to the conclusion that the main thrust of cost-benefit studies in the pesticide field is to improve our understanding of pest problems and thereby to improve the efficiency of pest control measures, to the benefit of both the industry and the public. (Author abstract by permission)

78-0722. Wegorek, W. (Instytut Ochrony Roslin, Poznan, Poland) **Wplyw stosowania pestycydow w rolnictwie na jakosc produktow. [Influence of the use of pesticides in agriculture on the quality of the products.]** *Postepy Nauk Roln.* 24(3): 49-54; 1977. (12 references) (Polish)

The objective of using agricultural pesticides to avoid losses and raise better crops is discussed. In Poland, 15% of the anticipated crop, estimated at 12 billion Zloty, are lost annually to pests. The potential menance of pests is even higher, and failure to control them could cause greater losses. In the fight for healthy and ample crops, pesticides are considered the ultimate weapon. Following widespread use, they could be transferred along the natural food chain from plants to animals and man. Pesticides could penetrate into the soil, from which chemical residues are then liable to be taken up by plants, or if washed away from the soil, they could reach creeks, rivers, lakes and oceans, and then be taken up by fresh-water and salt-water fish in trace quantities. One method to minimize chemical contamination of crops is to introduce a fixed time span between the last pesticide application and harvesting to insure their being reused or decomposed by the plants. Another method is to avoid a higher dosage than absolutely required. The inadequate selectivity of pesticidal compounds, which is regarded as an adverse factor, has caused poisoning of bees, ladybugs, golden-eyed flies, and parasitic hymenoptera. One pesticide side effect, thus far litle known and investigated, is their effect on the biochemical composition of plants due to inclusion of the compounds in metabolic processes during plant growth. Further efforts in this field should produce more selective pesticides aimed at certain organisms and agents with a strong, rapid, short-lasting effect, without accumulation in the environment or in the food chain.

78-0723. Reuber, M. D. (Frederick Cancer Res. Ctr., Frederick, MD 21701) **Review of toxicity test results submitted in support of pesticide tolerance petitions.** *Sci. Total Environ.* 9(2): 135-148; 1977.

Data submitted by chemical companies on chronic exposure of rats to 23 pesticides were reviewed. Albino rats were most frequently used, and, except for a 1 yr study and a 22 mo study, the studies continued for 2 yr. Many of the studies failed to correlate microscopic and gross observations. Hemangiosarcoma of the kidney, reticulum cell sarcoma of the brain, nephroblastoma, carcinoma of the pancreas, highly anaplastic carcinoma of the kidney with metastases, adenocarcinoma of the stomach, carcinoma of the prostate, mesothelioma of the pleura, and hepatic vein thromboses occurred in some of the test animals; they were not always noted as being unusual lesions. The number of animals at risk for tumors should include only those still alive when the tumor first appeared; some studies gave misleading results by including

experimental animals that had died earlier of other causes. Most of the studies attributed little or no changes to the compound tested; many require additional analyses of the data to determine if a valid conclusion can be made.

78-0724. Lohs, K. (Akad. Wiss. DDR, Berlin, DDR) **Der Missbrauch der chemischen Forschung. Dargestellt am Beispiel der Entwicklung von Massenvernichtungsmitteln. Resolution des Plenmus der Akademie der Wissenschaften der DDR vom 20.3. 1975. [Abuse of chemical research as illustrated by the development of chemical weapons. Resolution of the March 20, 1975 Plenary Session of the Academy of Sciences of East Germany.]** *Sitzungsber. Akad. Wiss. DDR Math. Naturwiss. Techn.* (6/N): 3-29; 1975. (33 references) (German)

The development of chemical weapons in the USA and other western countries is reviewed and a resolution of the East German Academy of Sciences, condemning chemical research put into the service of chemical warfare, is presented. The chemical warfare conducted by US troops in Vietnam has inflicated long-lasting ecological damage. Teratogenic and carcinogenic effects can also be expected due to the presence of dioxin in the herbicides deployed.

78-0725. Huber, G. (Farbwerke Hoechst AG, Bad Soden, Neuenhain, Germany) **Stages in the development of a plant protection agent.** *Tin Its Uses* (113): 7-9; 1977. (9 references)

The development of a plant protection agent is described. The first steps include a survey of the patent situation, a study of the corresponding literature, and synthesis of test compounds in the laboratory. All synthesized compounds with unknown activities are tested against insects, fungi, algae, and as herbicides. The use of field tests and the synchronization of field and laboratory testing are considered. Large scale field tests are then conducted on appropriate compounds. The cost of developing a new compound is discussed.

78-0726. Beitz, H. (Inst. Pflanzenschutsforsch., DDR-1532 Kleinmachnow, DDR) **Rueckstandstoxikologische Probleme bei der Intensivierung der Gemueseproduktion. [Residue toxologic problems in the intensification of vegetable production.]** *Wiss. Z. Humboldt Univ. Berlin Math. Naturwiss. Reihe* 25(4): 567-571; 1976. (12 references) (German)

General problems of pesticide residues in vegetables in East Germany are discussed. The increasing number of pesticides used, the ever-increasing pesticide consumption, and the recent toxicological finginds suggesting chronic toxicity and later effects of pesticides all call for stricter residue standards for pesticides in vegetables. DDT has been gradually phased out, and endrin, the only diene analog still in use, it restricted to the treatment of ornamental plants. Greenhouse conditions are partly favorable for the degradation and dilution of pesticide residues in most plants, but the lack of rain and UV radiation causes a considerable increase of residue levels on leaves, especially on lettuce. Ethrel residues of 0.76 and 0.70 ppm were found in tomato juice from tomatoes harvested 3-10 and 12-16 days, respectively, after treatment with 0.30-0.38% ethrel spray. Strict residue standards appear to be necessary for raw vegetables consumed without culinary preparation, and especially for vegetables to be used in baby food, e.g., carrots, spinach and cauliflower. Zero tolerance is required for baby food.

78-0727. Franci, M. ; Fusi, P. (Ist. Chim. Agrar. For., Univ. Firenze, Florence, Italy) **Adsorbimento di triazine simmetriche da parte di alcuni minerali argillosi attivati per riscaldemento. [Adsorption of *sym*-triazines by clay minerals activated by heat treatment.]** *Agrochimica* 21(3/4): 279-285; 1977. (10 references) (Italian)

The adsorption of prometryne, simazine, and atrazine from aqueous solutions on H^+ or Ca^{++} saturated montmorillonite, illite, and kaolinite activated by heat treatment in the temperature range of 150-850°C was studied as a function of the activation temperature. The adsorption was found to increase with increasing activation temperature and to decline after reaching a maximum. For Al-H-illite, maximal adsorption was found after heat treatment at 350°C (85.3% for prometryne, 50% for simazine, and 33.3% for atrazine). Al-H-montmorillonite and Al-H-kaolinite had adsorption maxima after heat treatment at 450°C (98% and 52.6%, for prometryne; 90% and 30% for simazine, and 85% and 25% for atrazine, respectively). The adsorptions on Ca modifications of montmorillonite, illite, and kaolinite were highest after activation at 650°C (17-20% for prometryne, 8.4-17% for simazine, and 8-13.5% for atrazine).

78-0728. Singhal, J. P. (Chem. Lab., Fac. Eng. Technol., Aligarh Muslim Univ., Aligharh, India) **Adsorption and interaction of 1,2-dibromo- 3-chloropropane. Part III. with kaolinite.** *Agrochimica* 21(3-4): 335-340; 1977. (10 references)

Adsorption was determined by adding various amounts of nemagon (DBCP) in solution to 10.0 ml of kaolinite suspension. Nemagon was completely adsorbed until a critical quantity of 4.2, 3.3, or 3.9 mmoles/100 g of H-, Na-, and Ca-saturated kaolinite, respectively, was reached. Adsorption then increased slowly until reaching a maximum of 22.7 mmoles/100 g Na-kaolinite or 19.8 mmoles/100 g Ca-kaolinite. Adsorption increased more slowly between 4.2 and approximately 7 mmoles/100 g of H-saturated kaolinite, decreased gradually until reaching approximately 4 mmoles/100 g, then increased again, reaching values higher than the previous maximum. A Langmuir plot of the ratio of nemagon in equilibrium suspension to adsorption nemagon versus the concentration of nemagon in equilibrium suspension showed a large deviation for H-kaolinite and small curvatures for the other two systems. This deviation and the pattern of adsorption indicate the adsorption occurs at different sites with different energy levels and different mechanisms.

78-0729. Sandhu, S. S. ; Warren, W. J.; Nelson, P. (Claflin Coll., SC) **Pesticidal residue in rural potable water.** *J. Am. Water Works Assoc.* 70(1): 41-45; 1978. (37 references)

Water samples were analyzed from one in every 100 households in Hampton and Chesterfield counties, South Carolina. Hampton County, a rural area with heavy, waterlogged soils, borders the Savannah River. The most commonly used insecticides in this area are toxaphene and carbaryl. Chesterfield County, also rural, is located in the sandhills of the lower Piedmont region. DDT, the major pesticide used here for about 20 yr, has been replaced by toxaphene and parathion. All water samples from both counties contained DDT. The mean lindane level in Chesterfield County water was 23 ng/l, as compared to 147 ng/l in Hampton County. Dieldrin levels were 55 ng/l and 204 ng/l, respectively. Mirex levels were 2 ng/l and 83 ng/l, respectively. The mean level of total organochlorine pesticide residues for Chesterfield County was 715 ng/l, compared to 894 ng/l for Hampton County. The strong negative correlation of TDE concentrations with pH indicates that low pH conditions favor the degradation of DDT to TDE. In agricultural areas, the mean levels of total residues were 257 ng/l for Chesterfield County and 841 ng/l for Hampton County. Mean residue levels in forest areas in Chesterfield County ranged from 3 ng/l for heptachlor epoxide to 237 ng/l for TDE. Mean residue levels in forest areas in Hampton County ranged from 3 ng/l for TDE to 239 ng/l for dieldrin. In residential areas the mean total residue levels were 221 ng/l in Chesterfield County and 1449 ng/l in Hampton County. The mean total residue levels in open wells were 180 ng/l (Chesterfield County) and 628 ng/l (Hampton County) compared to 430 ng/l (Chesterfield County) and 1047 ng/l (Hampton County) for covered wells. Surface water percolating through the soil was not a significant source of contamination. There was a positive correlation of the total residues with turbidity attributed to suspended colloidal clay and organic matter, indicating that at least part of the residue was adsorbed onto suspended clay particles or organic matter.

78-0730. Woodrow, J. E. ; Seiber, J. N.; Crosby, D. G.; Moilanen, K. W.; Soderquist, C. J.; Mourer, C. (Dep. Envi-

ron. Toxicol., Univ. California, Davis, CA 95616) **Airborne and surface residues of parathion and its conversion products in a treated plum orchard environment.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 175-191; 1977. (36 references)

Airborn pesticide residues were collected both within and downwind from a parathion-treated plum orchard by high volume sampling through XAD-4 macroreticular resin. Levels of paraoxon in excess of 100 ng/m^3 were found in orchard air, along with parathion, during the early days of two 21-day sampling studies. Paraoxon:parathion ratios in the orchard air were relatively constant, averaging *ca.* 0.5 for days 1 to 21 following treatment. Likely sources of airborn paraoxon include vaporization and dislodgement from soil and leaf surfaces, and chemical conversion of parathion in the air. Support for the latter came from observation of an increased paraoxon:parathion ratio in air samples collected downwind from the orchard. Atmospheric conversion of parathion to paraoxon, accelerated by sunlight, was indicated by both field and laboratory studies. Overall dissipation of parathion from the orchard air, soil, and leaf tissue proceeded to a considerable extent through breakdown to paraoxon under the dry climatic conditions of these studies. Eventual conversion to the relatively stable breakdown product, *p*-nitrophenol, was indicated from analysis of air in the orchard vicinity. (Author abstract by permission)

78-0731. Nigg, H. N. ; Allen, J. C.; Brooks, R. F.; Edwards, G. J.; Thompson, N. P.; King, R. W.; Blagg, A. H. (Agric. Res. Educ. Cent., IFAS, Univ. Florida, Lake Alfred, FL 33850) **Dislodgeable residues of ethion in Florida citrus and relationships to weather variables.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 257-267; 1977. (23 references)

Five different treatments of ethion on Valencia orange trees were compared for decay rates and for ethion monoxon and ethion dioxon production under different environmental conditions. The oxon metabolite levels observed were low and always below the residue level of ethion itself. There were no significant differences in the decay rates of ethion between treatments. A model of ethion decay utilizing environmental variables as a time base is presented. This model explains 94% of the variation observed in ethion decay during very wet and very dry periods in Florida. The application of these results and general experimental approach to worker safety reentry standards is discussed. (Author abstract by permission)

78-0732. Zepp, R. G. ; Wolfe, N. L.; Azarraga, L. V.; Cox, R. H.; Pape, C. W. (Environ. Res. Lab., U S EPA, Athens, GA 30601) **Photochemical transformation of the DDT and methoxychlor degradation products, DDE and DMDE, by sunlight.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 305-314; 1977. (20 references)

DDE and DMDE, degradation products of the pesticides DDT and methoxychlor, rapidly undergo an unusual photoisomerization in solution when exposed to sunlight. The isomerization involves the exchange of a vinyl chlorine and an *ortho* aromatic hydrogen. Other photoproducts identified were corresponding benzophenones and 1,1-diary-2-chloroethylenes. Quantum yields for the reactions were measured and then used to compute sunlight photolysis half-lives for DMDE and DDE. Although both compounds absorb only the short-wavelength ultraviolet component of sunlight, their photolysis was found to be surprisingly rapid. During summer at latitude 40°N, the photolysis half-lives near the surface of a water body are one hour and one day for dissolved DMDE and DDE, respectively. Photolysis of the DDE photoisomers is about an order of magnitude slower than that of DDE, suggesting that they may accumulate under environmental conditions. The DDE photoisomers photocyclize to form chlorinated dibenzofulvene and dichlorofluorenone. Neither DDE nor its photoisomers photoreact in solution to form PCB's. The environmental significance of these results is discussed and it is suggested that the persistence of DDE in inland surface waters may be related to its tendency to sorb onto sediments and biota where no light is present. (Author abstract by permission)

78-0733. Greichus, Y. A. ; Greichus, A.; Amman, B. D.; Call, D. J.; Hamman, D. C. D.; Pott, R. M. (South Dakota State Univ., Brookings, SD 57006) **Insecticides, polychlorinated biphenyls and metals in African Lake ecosystems. I. Hartbeespoort Dam, Transvaal and Voelvlei Dam, Cape Province, Republic of South Africa.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 371-383; 1977. (32 references)

Concentrations and distribution of chlorinated hydrocarbon insecticides, polychlorinated biphenyls (PCB's) and some metals were determined in two South African lakes, Hartbeespoort Dam and Voelvlei Dam. Water, bottom sediments, aquatic plants, aquatic insects, fish, fish-eating birds and their eggs were collected. Insecticides and PCB's were analyzed by thin layer and gas chromatography and mass-spectrometry. Analysis of metals was accomplished with atomic absorption spectrophotometry. Metals included arsenic, cadmium, copper, manganese, lead, zinc, and mercury. The insecticide residues most commonly found in both dams were DDE, DDD, DDT, and dieldrin. Hartbeespoort had higher levels than Voelvlei of insecticides and PCB's in all types of samples common to both lakes. Concentrations of PCB's having six or more chlorines increased with an increase in the trophic level. Concentrations of PCB's in the brains of the African birds were greater than the average total concentration of insecticides while the oppposite was true for carcasses. Biological magnification of insecticides and PCB's occurred in both lakes. Hartbeespoort Dam had higher levels than Voelvlei for all metals examined in bottom sediments and birds, except for copper in bird carcasses. Mercury levels in bird carcasses ranged from 2- to 5-fold greater than in fish while lead concentrations ranged from 2- to 10-fold greater. (Author abstract by permission)

78-0734. Dennis, D. S. ; Gillespie, W. H.; Maxey, R. A.; Shaw, R. (3065 S. Cauthay Circle, Aurora, CO 80013) **Accumulation and persistence of picloram (Tordon 10K) in surface water and bottom sediments in West Virginia.** *Arch. En-*

viron. Contam. Toxicol. 6(4): 421-433; 1977. (15 references)

Ponds and streams in Braxton, Kanawha, Mason, Jackson, and Hampshire Counties, West Virginia, were sampled to determine the accumulation, persistence, and movement of picloram residues in surface waters and bottom sediments. The highest residue level of 437 μg/L in water and 657 μg/kg dry weight basis (243 μg/kg wet weight basis) in bottom sediments were detected within one to three weeks after application of picloram (Tordon 10K) pellets at the rate of 44.8 product kg/ha. Residue levels in water and sediments decreased with distance from application sites and time since application. (Author abstract by permission)

78-0735. Schneider, A. D. ; Wiese, A. F.; Jones, O. R. (Southwestern Great Plains Res. Ctr., ARS, USDA, Bushland TX 79012) **Movement of three herbicides in a fine sand aquifer.** *Agron. J.* 69(3): 432-436; 1977. (9 references)

Water containing 2469 g picloram, 25,200 g atrazine, 472 g trifluralin, and a nitrate tracer was injected into a sand aquifer through a dual-purpose well for 10 days at an average rate of 81.8 m^3/hr. The well was pumped for 12 days beginning 10 days after water injection was completed. No picloram was detected in an observation well 20 m from the dual-purpose well until 84 hr after recharge began; concentrations then repeatedly increased and decreased, reaching a maximum of 0.135 ppm picloram 192 hr after recharge began. Atrazine levels in the observation well remained extremely low until 96 to 120 hr after recharge began. During pumping picloram concentrations in the dual purpose well and an observation well 9 m away decreased and had fallen below 0.01 ppm by the time pumping was completed. Atrazine levels in all three wells decreased to below 0.10 ppm after 288 hr of pumping. The trifluralin level in the dual-purpose well was about 0.054 ppm at the start of pumping; trifluralin levels fluctuated and became almost undetectable after 240 hr of pumping. No herbicides were detected in a third observation well 45 m away. The above average trifluralin concentration in the first water pumped indicated adsorption to aquifer particles around the well. Picloram and atrazine moved freely through the aquifer. Over 90% of each herbicide was recovered with the pumped water. Pumping could be used to recover herbicides accidentally injected into a relatively static aquifer, and the water could be used to irrigate crops resistant to the herbicides.

78-0736. Piccinini, M. ; Bonciani, S. (Lab. Chim. Prov. Firenze, Florence, Italy) **Indagine sulla contaminazione da pesticidi e policlorobifenili di acque della provincia di Firenze. [Investigation of water pollution by pesticides and** polychlorobiphenyls **in the province of Florence.]** *Boll. Lab. Chim. Prov.* 26(5): 197-216; 1975. (18 references) (Italian)

Water samples taken during 1971-1974 from the Arno River at two waterworks intakes and from springs in the province of Florence were analyzed for pesticides and PCB's by gas chromatography. Apart from one sample with 0.0019 ppb, *p,p'*-DDE was found in trace amounts only. Lindane was found in all 11 samples (0.0002-0.0186 ppb); α-BHC was found in trace amounts in 4 samples and in quantities of 0.0012-0.0130 ppb in the others; δ-BHC was found in trace amounts in 3 samples and in quantities of 0.0011-0.0038 ppb in the other samples. Two samples contained trace amounts of aldrin; dieldrin was found in trace amounts in three samples, while 0.0001 ppb was found in another. Eight samples contained *o,p'*-DDT (from traces to 0.0006 ppb) and *p,p'*-TDE (from traces to 0.0035 ppb), and 10 samples contained *p,p'*-DDT, from trace amounts in one sample to 0.0035 ppb in the others. One sample also contained ronnel (0.0055 ppb) and traces of thiometon and diazinon. The ten samples analyzed for PCB contained such substances in quantities of 0.130-0.018 ppb.

78-0737. Custot, F. ; Chambolle, M.; Mezonnet, R. (Lab. Coop. Inform. Protect. Represent. Consommateurs, F-95390 Saint-Prix, France) **Le traitement des fruits et legumes avant et apres rocolte et la protection de la sante des consommateurs. [Treatment of fruits and vegetables before and after harvesting and protection of the consumers' health.]** *Bull. Acad. Natl. Med. Paris* 161(7): 538-542; 1977. (French)

Protection of the consumers' health from the harmful effects of pesticide residues requires the official testing and approval of pesticides, rules on the utilization and sale of pesticides, the establishment of maximum allowable residue levels in food, systematic residue analyses, and proper labeling of foods concerning the use of pesticides. Only 1.4% of the foods tested in 1974 exceeded the tolerance limits in France. Certain pesticides are, however, problematic; they include diphenyl in citrus fruits and dithiocarbamates in lettuce, especially when grown in greenhouses. Dithiocarbamates may form nitrosamines and ethylene thiourea, which was found to have teratogenic and mutagenic effects in mice and rats and to cause thyroid and liver tumors. The ADI was set at 0.005 mg/day for dithiocarbamates.

78-0738. Kpekata, A. E. (Inst. Aquatic Biol., Ghara Acad. Sci., Achimota, Ghana) **Polychlorinated biphenyls (PCB's) in the rivers Avon and Frome.** *Bull. Environ. Contam. Toxicol.* 14(6): 687-691; 1975. (6 references)

Surface water samples were collected at four bridges on the River Avon and two bridges on the River Frome in the area of Bristol, England and analyzed for chlorinated insecticides and PCBs. Fish caught from bridges on the River Avon were also analyzed for these substances. Aroclor 1254 levels reached 431.0 ppm in the River Avon. The highest level of Aroclor in fish was 29.4 ppm of Aroclor 1260 in bleak liver. BHC isomers, dieldrin, and DDT and its metabolites were detected in surface water samples at levels of ng/l. These same insecticides were determined in fish, generally at levels of a few fractions of ppm wet weight.

78-0739. Saschenbrecker, P. W. (Guelph Area Lab., Agric. Canada, Guelph, Ontario N1G 1Y4, Canada) **Levels of terminal pesticide residues in Canadian meat.** *Can. Vet. J.* 17(6): 158-163; 1976. (22 references)

Samples of beef and mutton renal fat, pork dorsal fat, and fowl fat from meat packing establishments in Canada were analyzed for pesticides by flame-photometric gas chromatography. No pesticide residues were found in 40.56% of all samples tested. Average pesticide residues in beef fat ranged from 37.0 ppb for DDT and its metabolites to 0.23 ppb for chlordane. Average residues in mutton fat ranged from 57.6 ppb for DDT and its metabolites to 0.04 ppb for methoxychlor. Averages in pork fat ranged from 95.1 ppb for DDT and its metabolites to 0.27 ppb for chlordane. Averages in fowl fat ranged from 44.1 ppb for DDT and its metabolites to 0.007 ppb for methoxychlor. Levels of DDT and its metabolites decreased exponentially in mammalian species between October 1969 and October 1974, and approached a near-zero slope towards the end of that period. Residues in beef, mutton, and pork fat were 64.68, 71.36, and 192.51 ppb, respectively, between October 1969 and April 1970. They had decreased to 15.23, 16.07, and 102.36 ppb, respectively, by October 1974. Residues in mutton had already decreased to 27.11 ppb by October 1971, and residues in beef had decreased to 33.97 ppb. Residues in pork had reached 111.39 ppb by October 1972. Residues of DDT and its metabolites in fowl fat increased from 37.33 ppb between April and October 1971 to 66.92 ppb for the period April to October 1973, then decreased to 58.37 ppb by 1974.

78-0740. Szokolay, A. ; Uhnak, J.; Madaric, A. (Natl. Inst. Hyg., Bratislava, Czechoslovakia) **Porovnanie relativnej kumulacie hexachlorbenzenu s izomermi hexachlorcyklohexanu v zivocisnych potravinach. [Comparison of relative cumulation of hexachlorobenzene with isomers of hexachlorocyclohexane in animal foods.]** *Cesk. Hyg.* 22(10): 468-473; 1977. (14 references) (Slovak)

The accumulation of HCH isomers determined by an ecological study and a feeding test based on the known content in fodder and eggs was compared. The two methods indicated different amounts of α-HCH. Hexachlorobenzene (HCB) residues were measured in butter, mothers' milk and a ten wk long feeding test using egg-laying hens. A higher relative accumulation of β-HCH in the ecological model and the eggs was demonstrated. The feeding test on hens indicated lower persistance of α-HCH compared with β-HCH and HCB.

78-0741. Terce, M. ; Lefebvre-Drouet, E.; Calvet, R. (Stn. Sci. Du Sol, INRA, Route de St. Cyr, Versailles, France) **Degradation of adsorbed atrazine on an aluminum montmorillonite.** *Chemosphere* 6(11): 753-758; 1977. (12 references)

Adsorption was determined in a suspension of montmorillonite saturated with aluminum mixed with a 0.9 mg/ml ethanolic solution of atrazine. When the clay-atrazine system was unheated, infrared spectroscopy indicated that the adsorbed atrazine was in the neutral and protonated forms, and was not hydrolyzed. When the system was heated at 50°C or 100°C for 24 hr, hydroxyatrazine was formed. After 1 year the stored clay was treated successively with water, 1 N BaCl$_2$ solution, and methanol. Infrared absorption spectra indicated a slight hydrolysis. Water desorbed the smallest amount of atrazine and methanol the largest. Most of the desorbed atrazine remained biologically active.

78-0742. Pillai, V. N. R. (Dep. Chem., Univ. Calicut, Kerala 673635, India) **Role of singlet oxygen in the environmental degradation of chlorthiamid to dichlobenil.** *Chemosphere* 6(11): 777-782; 1977. (13 references)

Solutions of the herbicides chlorthiamid and dichlobenil were irradiated separately in photochemical reactors with a 125 W high-pressure mercury-quartz lamp. There was no change when chlorthiamid was irradiated for 50 hr. When 1.03 g of chlorthiamid and 15 mg riboflavin were irradiated together 0.20 g dichlobenil, 0.45 g benzonitrile, and 0.30 g of an unidentified resinuous product were recovered. When nitrogen was bubbled through the solution containing chlorthiamid and riboflavin as it was being irradiated, there was no change after prolonged irradition. The rate of the reaction was increased when oxygen was bubbled through the solution. The degradation of chlorthiamid occurs through dye-sensitized singlet oxygenation and subsequent reactions. Benzonitrile is formed through reductive dechlorination of dichlobenil. A 0.0001 M dichlobenil solution was completely degraded after being irradiated for 50 hr without any sensitizer; benzonitrile and a small amount of 2-chlorobenzonitrile were formed. Adding riboflavin did not affect these results.

78-0743. Zitko, V. (Fish. Mar. Serv., St. Andrews, N.B. EOG 2XO, Canada) **Nonachlor and chlordane in aquatic fauna.** *Chemosphere* 7(1): 3-7; 1978. (20 references)

Cis- and *trans*-nonachlor, chlordane, polychlorinated biphenyls (PCB's), and DDE were measured by gas chromatography-mass spectrometry in lipid samples from aquatic fauna collected on the east coast of Canada. Both the highest and lowest levels of *trans*-nonachlor, 1.88 μg/g lipid and 0.057 μg/g lipid, were found in cod liver. Cod liver also contained the highest level of *cis*-nonachlor, 0.074 μg/g lipid. One of two samples each of cod liver, lobster hepatopancreas, and commercial herring oil did not contain detectable levels of nonachlor. Commercial redfish oil contained the highest level of chlordane, 0.179 μg/g lipid. PCB levels ranged from 3.67 μgs/g lipid in commercial herring oil to 46.0 micrograms/g lipid in cod liver. DDE levels ranged from 0.43 μg/g lipid in commercial herring oil to 12.7 μg/g lipid in cod liver. All of these values were exceeded by previous values obtained with white shark liver, and several were exceeded by previous values obtained with other species.

78-0744. Stadler, D. F. (Dtsch. Hydrogr. Inst., Bernhard Nocht Str. 78, D-2000 Hamburg 4, Germany) **Chlorinated hydrocarbons in the seawater of the German Bight and the western Baltic in 1975.** *Dtsch. Hydrogr. Z.* 30(6): 13-215; 1977. (23 references)

Water samples from the German Bight and the western Baltic were analyzed for pesticides. In the millimeter lay-

er of the German Bight average pesticide concentrations ranged from 16 ng/l for lindane to 0.56 ng/l for *p,p'*-DDE. In the 1 m layer of the German Bight average pesticide concentrations ranged from 6.5 ng/l for α-BHC to 0.11 ng/l for *p,p'*-DDE. In the 5 m to 10 m layer of the German Bight average concentrations ranged from 5.5 ng/l for α-BHC to 0.10 ng/l for *p,p'*-DDD (TDE). In the 10 m to 44 m layer of the German Bight concentrations averaged from 4.2 ng/l for α-BHC to 0.08 ng/l for *p,p'*-DDD. In the micron layer of the western Baltic lindane levels averaged 212 ng/m², α--BHC levels averaged 34 ng/m², *p,p'*-DDT levels averaged 14 ng/m², and dieldrin and *p,p'*-DDD were not detected. In the millimeter layer of the western Baltic lindane levels averaged 12 ng/l, α-BHC levels averaged 10 ng/l, dieldrin levels averaged 0.66 ng/l, *p,p'*-DDT levels averaged 0.75 ng/l, and *p,p'*-DDD was not detected. In the 1 m layer of the western Baltic average pesticide concentrations ranged from 6.8 ng/l for α-BHC to 0.12 ng/l for *p,p'*-DDD. There was no significant correlation with precipitation. In the 5 m to 10 m layer of the western Baltic lindane levels averaged 4.7 ng/l, α-BHC levels averaged 6.5 ng/l, *p,p'*-DDT levels averaged 0.06 ng/l, and *p,p'*-DDD was not detected. In the 10 m to 48 m layer of the western Baltic lindane levels averaged 3.3 ng/l, α-BHC levels averaged 4.8 ng/l, dieldrin levels averaged 0.06 ng/l, *p,p'*-DDT levels averaged 0.06 ng/l, and *p,p'*-DDD was not detected. There were no significant correlations between pesticide concentration and precipitation, visible particulate matter, or distance from land.

78-0745. Bernard, E. C. (Univ. Georgia, Athens, GA) **Factors affecting cotton stunt: movement and persistence of 1,2-dibromo-3- chloropropane in a layered soil: and effects of certain phyto-parasitic nematodes on cotton growth and yield.** *Diss. Abstr. Int. B* 38(8): 3492; 1978.

Treatments of 1,2-dibromo-3-chloropropane (DBCP) were applied in a Coastal Plain soil consisting of 20-25 cm of a loamy sand topsoil, a 5-8-cm sand-textured plow-pan layer and a sandy clay subsurface. Treatments comparing the effects of subsoiling and rate and depth of application were: 1) 10 kg/ha DBCP injected at a depth of 18 cm, not subsoiled; 2) 10 kg/ha DBCP injected at 18 cm, subsoiled; 3) 10 kg/ha DBCP injected at 35 cm, subsoiled; 4) 13.5 kg/ha DBCP injected at 35 cm, subsoiled. DBCP was extracted from soil cores with hexane and quantified by gas chromatography; concentrations were calculated as μg DBCP/g oven-dried soil. Samples were taken on five dates in each of two years. During the first two weeks after treatment in April, 1975, more than 4 cm of rain fell at the treatment site. During the comparable period in 1976, there was no measurable rainfall at the site. Subsoiling increased lateral movement and downward penetration of DBCP in both years, but the effect was more pronounced in the wet year. The plow-pan did not allow passage of DBCP to the subsurface unless it was disrupted by subsoiling. Increasing the rate of application (10 or 13.5 kg/ha) moderately improved coverage of nematicidal doses in 1975, but the effect was only marginal in 1976. Increasing the depth of placement (18 or 35 cm) improved coverage in both years but was more important during the drier year (1976). Deep placement extended the time required for the fumigant to escape into the atmosphere. Rainfall in 1975 probably acted to decrease the number and size of air-filled pores, thus preventing rapid movement of DBCP to the soil surface and subsequent loss to the atmosphere. (Author abstract by permission, abridged.)

78-0746. Freed, V. H. ; Chiou, C. T.; Haque, R. (Environ. Health Sci. Cent., Oregon State Univ., Corvallis, OR 97331) **Chemodynamics: transport and behavior of chemicals in the environment--A problem in environmental health.** *Environ. Health Perspect.* 20: 55-70; 1977. (88 references)

The partition coefficient of a compound provides a good measure of its tendency to accumulate in living organisms: compounds that accumulate have low water solubility and high partition coefficient. Such compounds include 2,4,-5,2',4',5'-PCB, DDT, leptophos, and 2,4,5,2',5'-PCB. Bioconcentration factors in rainbow trout bear out this generalization. In many instances quantitative data and usable mathematical relationships have been developed between the properties of a chemical and its transport and behavior in the environment. Ambient conditions of temperature, air movement, moisture, presence of other chemicals and the concentration and properties of the subject chemicals influence adsorption, evaporation, partitioning, and degradation. The pH of the solution influences the stability and solubility of certain pesticides. The behavior of chemicals in a soil matrix is controlled largely by adsorption and leaching-diffusion. Water solubility of the chemical, adsorption, soil type, and moisture and percolation velocity play an important role in leaching.

78-0747. Pakhov, G. M. ; Petrov, R. V.; Tsapko, V. V.; Vanyurikhina, L. N. (A. N. Marzeev Kiev Sci. Res. Inst. Gen. Commun. Hyg., USSR) **Vliyanie primeneniya yadokhimikitov i udobreniy v vodookhrannoy zone s istochnikami iskusstvennogo popolneniya zaposov podzemnykh vod. [The effect of the use of pesticides and fertilizers in the water protection zone with sources of artificial replenishment of underground water reserves.]** *Gig. Sanit.* (3): 101-102; 1976. (Russian)

The effects of pesticides and mineral fertilizers on groundwater quality were studied in water protection zones with sources of artificial replenishment of groundwater reserves. Some fields were dusted with metaphos (methyl parathion) (30 kg/ha); residues (0.2 mg/kg) were found two days layer in the upper 20-cm soil layer, but no residues were found in the upper 2-m layer after 15 days. The groundwater contained no metaphos. Granosan, introduced with dressed seeds, was not found in soil and groundwater samples. DDT, applied at a rate of 50 kg/ha (5.5% dust), was found in the upper 20-cm soil layer in concentrations of 0.2, 0.08, 0.05 and 0.01 mg/kg 2, 5, 10 and 20 days later, respectively, but no DDT was found in the groundwater. Atrazine, applied at a rate of 10 kg/ha, was found only in the upper 15-20 cm soil layer, but no residues were found in the groundwater. The analyses of river and well water samples from the same area revealed only BHC (0.00004-0.0102 mg/liter). The findings indicate the necessity to restrict the use of BHC in water capture areas.

78-0748. Anan'ev, N. I. ; Bel'gibaev, E. M. (Tselinograd Med. Inst., Tselinograd, USSR) **Zagryaznenie pochvy i vo-**

doistochnikov gerbitsidami, primenyaemymi v sel'skom khozyaystve Tselinnogo Priishim'ya. [Soil and water pollution by agricultural herbicides used in Tselinnoe Priishim'e.] *Gig. Sanit.* (7): 108-109; 1977. (Russian)

Soil, water and benthic sediment samples taken during the 1970-1974 period in the Tselinnoe Priishim'e region where pesticides are used in fairly large amounts, and partly distributed by means of aircraft, were analyzed for residues. Seventeen of the 216 surface and groundwater samples, 14 of the 71 soil samples, and 12 of the 47 benthic sediment samples analyzed contained pesticide residues. 2,4-butyl ester (up to 0.5 mg/liter), 2,4-D amine salt (up to 0.02 mg/liter), lindane (up to 0.2 mg/liter), but no DDT and carbaryl were found in the water samples. The soil samples contained lindane (up to 2 mg/kg, present in 50.7% of all positive samples), 2,4-D butyl ester (up to 0.6 mg/kg), DDT (up to 0.2 mg/kg), and heptachlor (up to 0.2 mg/kg), but no organomercurials and organophosphates. Residues were found in the soil of untreated fields up to 1 km distance from treated ones in wind direction.

78-0749. Kovaleva, E. S. ; Talanov, G. A. (All-Union Sci. Res. Inst. of Vet. Hyg., Moscow, USSR) **Absorbtsiia TKhM-3 i fozalona iz pochvy i ikh migratsiia v rasteniia. [Uptake of TCM-3 and phosalone from the soil and their migration into plants.]** *Gig. Sanit.* (12): 87-88; 1977. (3 references) (Russian)

Trichlorometaphos-3 (TCM-3) and phosalone were applied on sandy soils at a rate of 5 kg/ha before sowing, and the residue levels were determined gas chromatographically in the upper 10-cm soil layer as well as in corn, potato, beet, pea and oat plants grown in those soils 20-140 days after treatment. The TCM-3 levels of the soil were 0.53-.145 mg/kg 20 days after treatment, and 0.06-0.75 mg/kg after 140 days. The TCM-3 residues determined after 20 days were 0.05 mg/kg in corn plants, 0.04 mg/kg in potato tops and 0.04 mg/kg in pea and oat plants. A TCM-3 level of 0.04 mg/kg was found in beet tops after 35 days. Only traces were found in potato and beet tops after 95 days, 0.03 mg/kg in pea and oat plants after 95 days, and 0.05 mg/kg in corn plants after 140 days. The phosalone levels of the soil were 0.19-1.6 mg/kg after 20 days, and 0.02-0.03 mg/kg after 140 days. Corn plants contained only traces of phosalone on the 20th day, and no residues were found in the other plants 60 days after the treatment. The findings indicate that the migration of organophosphorus pesticides from the soil into the plants has no practical significance due to rapid degradation.

78-0750. Chawla, R. P. ; Joia, B. S.; Kalra, R. L. (Punjab Agric. Univ., Ludhiana 141004, India) **Lindane residues in onion, following its granular application for the control of onion maggot.** *Indian J. Agric. Sci.* 45(11-12): 503-505; 1975. (11 references)

Transplanted onions were treated with 6% lindane at the rate of 12.5 kg/ha by broadcast. After extraction and elution, soil and crop samples were extracted by gas-liquid chromatography. The residues were confirmed by thin-layer chromatography. The initial insecticide level in the soil was 0.079 ppm, which decreased to about 0.06 ppm in about 20 days and 0.029 ppm in 84 days, when the crop was mature. Residues in the onion bulbs were 0.115 ppm at the green edible stage, 59 days after treatment, and 0.139 ppm 84 days after treatment. Residues in the onion tops were 0.147 ppm 59 days after treatment and 0.019 ppm 84 days after treatment. These residues are less than the 1-ppm tolerance of lindane on onion recommended by the U. S. Environmental Protection Agency.

78-0751. Dumas, T. ; Bond, E. J. (Res. Inst., Canada Dep. Agric., Univ. Sub Post Off., London, Ontario, N6A 5B7, Canada) **Bromide residues in apples fumigated with ethylene dibromide.** *J. Agric. Food Chem.* 23(1): 95-98; 1975. (6 references)

Red Delicious apples were fumigated with ethylene dibromide for 4 hr at 25, 20, and 13°C at dosages ranging from 8 to 24 mg/l. McIntosh and Spy apples were also fumigated with 12 mg/l ethylene dibromide at 13°. The highest inorganic bromide residue in Red Delicious apples, 4.8 ppm, was measured 21 days after fumigation with 24 mg/l at 13° C. The lowest, 2.0 ppm, was measured 7 days after fumigation with 8 mg/l at 25° C. Control apples contained inorganic bromide residues of 0.5 ppm. When newly harvested Red Delicious apples were held at the treatment temperature for 3 days and then stored at 4°, the minimum ethylene dibromide residue, 0.01 ppm, was obtained 3 weeks after treatment at 13° and 12 mg/l and 1 week after 3 days at 25° and treatment with 8 mg/l. The highest residue, 6.5 ppm, was obtained at the start of storage in apples treated with 12 mg/l at 13°. When Red Delicious apples were held in cold storage for 10 mo, then fumigated with 12 mg/l, the smallest residue, 0.007 ppm, was obtained 4 weeks after being held at 13° 2 days after fumigation. The largest residue, 12.8 ppm, was obtained after the apples were held 1 day after treatment at 13°. Immediately after treatment of Red Delicious apples at 13° and 12 mg/l, ethylene dibromide residues in the skin, outer pulp, inner pulp, and seeds were 308, 59, 46, and 25 ppm, respectively. After 4 days at 13°, residues in these parts of the apple were 26, 5, 6, and 30 ppm, respectively. When Red Delicious, McIntosh, and Spy apples were treated simultaneously and held at 13°, initial residues were between 50 and 60 ppm for Red Delicious, between 60 and 70 ppm for Spy, and 120 ppm for McIntosh. Two days later, residues had decreased to about 10 ppm in McIntosh, slightly over 6 ppm in Red Delicious, and between 3 and 4 ppm in Spy. Residues decreased to less than 1 ppm after 5, 6, and 7 days in McIntosh, Spy, and Red Delicious apples, respectively.

78-0752. Owens, R. B., Jr. ; Dimond, J. B.; Getchell, A. S. (Maine Agric. Exp. Stn., Univ. Maine, Orono, ME 04473) **DDT: Persistence in northern spodosols.** *J. Environ. Qual.* 6(4): 359-360; 1977. (11 references)

DDT was used between 1954 and 1967 for the control of spruce budworm (*Choristoneura fumiferana*) in northern Maine. Soils originally tested in 1968 were resampled in

1973 and 1976 to help clarify the degree of persistence of DDT in northern spodosols. Soils from areas sprayed three times at 1.12 kg/ha continue to contain up to 4.5 ppm DDT residues 12 years after application. Pesticide levels in the soils sampled in 1973 and 1976 were not significantly different from levels measured in 1967. Also, analyses of soil profile samples through the A and B horizons indicated that > 96% of the residues were still located in the O1 and O2 horizons. (Author abstract by permission)

78-0753. Swoboda, A. R. ; Merkle, M. G. (Soil and Crop Sci. Dep., Texas A&M Univ., College Station, TX 77843) **Movement of methazole and its degradation products in soils** *J. Environ. Qual.* 6(4): 385-388; 1977. (6 references)

The movement of 2-(3,4-dichlorophenyl) -4- methyl-1,2,4- oxadiazolidine-3, 5-dione (methazole) tagged with ^{14}C was studied in Lakeland sand, Nacogdoches sandy loam, Norwood clay loam, and Miller clay soils. The herbicide, at a rate equivalent to 3.4 kg/ha, was incubated for 30 days with each soil. The treated soil, equivalent to 2.5 cm in a 15-cm diameter column, was placed on the surface of untreated soil contained in columns. The columns were subsequently leached daily with 1.25 cm of distilled water for 42 days. Very little ^{14}C-activity was detected in the leachate. The percentage of ^{14}C-tagged material added which leached through the soils was 2.75, 0.84, 2.87, and 1.01 for the Lakeland, Nacogdoches, Norwood, and Miller soils, respectively. Upon sectioning the columns, the majority of ^{14}C-active materials was found in the 0- to 2.5- and 2.5- to 7.5-cm sections, although a considerable amount of material was found in the 7.5- to 15-cm sections of the Lakeland and Norwood soil columns. Very little herbicide was found below 15 cm in any of the soil columns. Essentially all of the ^{14}C-active material present in the soils could be extracted by either shaking for 2 hours with methanol or refluxing with methanol for 16 hours in a soxhlet extractor. Wet combustion of soil samples indicated that very little ^{14}C-activity remained in the samples extracted by the soxhlet method. Methazole was readily converted to 1-(3,4-dichlorophenyl) -3- methylurea (DCPMU) and 1-(3,4-dichlorophenyl) urea (DCPU) in the soils studied, with DCPMU being present in the largest quantities. Very little unaltered methazole or unidentified degradation products were detected in the soils. (Author abstract by permission)

78-0754. Supak, J. R. ; Swoboda, A. R.; Dixon, J. B. (Texas Agric. Exp. Stn., Lubbock, TX 79409) **Volatilization and degradation losses of aldicarb from soils.** *J. Environ. Qual.* 6(4): 413-417; 1977. (13 references)

Aldicarb, 2-methyl-2(methylthio) propionaldehyde *O*-(methylcarbamo yl) oxime, volatilization from two soils amended with 1 mg toxicant per gram of soil was determined by GLC analysis of trapped pesticide vapors. Volatilization losses were generally depressed by the presence of water and elevated temperatures. Losses ranged from 0.01 to 0.18% of the applied dose during an 18-day period. The highest mortality rates of bioassay organisms subjected to the volatilization vapors were observed at 23°C in a soil system being gradually dried by a stream of dry air. Degradation of aldicarb at 23° C exceeded 10% of the applied dose only in the acid Beaumont soil, whereas 24 and 46% of the added material degraded in the moist and dry soil, respectively. At 42°C, extensive degradation occurred in both acid and calcareous soil systems; losses ranged from 38 to 82% in the moist samples and 61 to 96% in those allowed to dry to an air-dry state. (Author abstract by permission)

78-0755. Juo, A. S. R. ; Oginni, O. O. (Int. Inst. Trop. Agric. Oyo Rd., P.M.B. 5320, Ibadan, Nigeria) **Adsorption and desorption of paraquat in acid tropical soils.** *J. Environ. Qual.* 7(1): 9-12; 1978. (16 references)

Adsorption of paraquat by six common soil types from southern Nigeria was studied. Adsorption data conformed with linear Langmiur isotherm. Adsorption maximum (*b*) calculated from the Langmuir equation ranged from 1,200 to 7,500 μg/g of soil. The iron oxide-rich soil derived from basalts adsorbed the highest amount, while the strongly acidic soils derived from sedimentary rocks adsorbed the least amount of paraquat. Desorption data indicated that a substantial portion (40 to 70%) of the adsorbed paraquat could not be recovered by 12 successive extractions with dilute $CaCl_2$ solution. (Author abstract by permission)

78-0756. Hall, J. K. ; Hartwig, N. L. (Pennsylvania Agric. Exp. Stn., University Park, PA 16802) **Atrazine mobility in two soils under conventional tillage.** *J. Environ. Qual.* 7(1): 63-68; 1978. (20 references)

Atrazine mobility was studied in two different Pennsylvania soils under conventional tillage. The herbicide was applied at four preemergence rates (1.1, 2.2, 4.5, and 9.0 kg ai (active ingredient)/ha) to one soil and as a 4.5-kg ai/ha equal split treatment (fall surface-spring preemergence; early spring surface-spring preemergence) to another soil heavily infested with quackgrass. Suface residues from each initial application (2.2 kg ai/ha) were plowed-down in early May. Atrazine mobility, dissipation rate, and residual activity were evaluated by chemical analysis and oat bioassay of soil cores sampled at 15-cm increments to 122 cm and from chemical analysis of suction lysimeter leachates. Chemical recovery levels indicated that atrazine principally reacted and dissipated in the plow-layer in both soils. Atrazine applied at 2.2 and 4.5 kg/ha was detected in each to a depth of 76 cm approximately 2 mo after application. At these rates, soil concentrations ranged from 0.01 to 1.12 ppm, recovery levels ranged from 47 to 71%, and 83 to 100% of the residual atrazine was detected in the surface 30 cm of soil. However, some "leakage" of atrazine through the coarse subsoil structural units did occur since very low levels were detected in lysimeter leachates collected at 122 cm. By the end of the growing season, 3 to 21% of the atrazine applied at these same rates was recovered in the surface 46 cm of soil, except where one-half of the 4.5 kg/ha rate was plowed-down in early spring (3% recovered from 46 to 76 cm). The bioassay procedure did not accurately predict atrazine residue concentrations in either soil. It appeared from this study that application of atrazine

to fine-textured, conventionally tilled soils at rates ranging from 1.0 to 4.5 kg/ha would not seriously affect ground water supplies through contamination by internal soil damage. (Author abstract by permission)

78-0757. Triplett, G. B., Jr. ; Conner, B. J.; Edwards, W. M. (Ohio Agric. Res. Dev. Cent., Wooster, OH 44691) **Transport of atrazine and simazine in runoff from conventional and no-tillage corn.** *J. Environ. Qual.* 7(1): 77-84; 1978. (25 references)

On 0.4- to 3.5-ha watersheds, highest concentrations of atrazine (0.48 ppm) and simazine (1.2 ppm) were present in runoff occurring soon after application and declined rapidly for later events. Quantity of herbicides transported increased with the amount of runoff, and was inversely related to the length of time between application and the runoff event. A maximum of 6% of the applied herbicide was transported from the field even under the most favorable conditions, and the average for all watersheds was < 2%. Less runoff and herbicide loss occurred from areas planted to notillage than to conventional corn (*Zea mays* L.). In a multiple regression analysis of the factors, the natural logarithm (ln) of days after application and a tillage x application rate interaction were useful in predicting the natural logarithm of herbicide concentration in runoff. Factors from the multiple regression analysis used in this study were important in predicting concentration of atrazine and other pesticides when applied to data published by other workers. (Author abstract by permission)

78-0758. Martin, G. B. ; Gosselin, C. (Dep. Vivres, Fac. Sci. Agric. Aliment. Cent. Rech. Nutr., Univ. Laval, Quebec, G1K 7P4, Canada) **Organochlorinated residues in wastewaters before and after treatment.** *J. Environ. Sci. Health [A]* 13(1): 1-11; 1978. (8 references)

The effect of waste water treatment on pesticide concentrations was studied in Valcartier, Quebec, a town of about 5000 inhabitants. The treatment system consisted of sand deposition, decantation, and degreasing stages, followed by aeration basins and chlorination. The samples in which pesticides were measured were taken immediately after sand deposition and immediately after the aeration basins. Over a 5 day period TDE concentrations after sand deposition ranged from trace concentrations to 0.07 ppb TDE. During the same time *p,p'*-DDT concentrations at the same location ranged from trace concentrations to 0.08 ppb. TDE concentrations after the aeration basins ranged from trace concentrations to 0.03 ppb during the same period, and *p,p'*-DDT concentrations after the aeration basins ranged from trace concentrations to 0.02 ppb. On one of these 5 days, pesticide concentrations were measured hourly. TDE concentrations ranged from 0.02 ppb to 0.40 ppb after sand deposition, with a mean of 0.08 ppb. Concentrations of *p,p'*-DDT after sand deposition ranged from trace concentrations to 0.02 ppb. Both maximum levels occurred at the same time, 4:00 pm. The minimum TDE concentration coincided with one of the trace concentrations of *p,p'*-DDT at 8:00 am. After the aeration basins, TDE levels ranged from 0.01 ppb to 0.12 ppb, and *p,p'*-DDT levels ranged from trace concentrations to 0.06 ppb. Maximum and minimum levels did not coincide. The mean TDE level after the aeration basins was 0.03 ppb.

78-0759. Taruski, A. G. ; Olney, C. E.; Winn, H. E. (Grad. Sch. Oceanogr., Univ. Rhode Island, Kingston, RI 02881) **Chlorinated hydrocarbons in Cetaceans.** *J. Fish. Res. Board Can.* 32: 2205-2209; 1975. (26 references)

Eleven blubber samples from stranded cetaceans, one from a whale fishery, two from cetaceans that died in captivity, and four obtained by biopsy dart from free swimming cetaceans were analyzed for pesticides. α-chlordane was not detected in two samples from humpback whales; the highest level in humpback whales was 0.2 ppm. The same two samples from humpback whales also contained no dieldrin; the highest dieldrin level in humpback whales was 1.2 ppm. Total DDT and metabolites levels in humpback whales ranged from 1.4 ppm to 23.1 ppm. The α-chlordane level was not detectable in two blubber samples from sperm whales and 0.3 ppm in the third. Dieldrin was not detected in sperm whale blubber. Total DDT and metabolites levels in sperm whales ranged from 1.1 ppm to 15.5 ppm. Among other species the highest α-chlordane level was 5.0 ppm in a sample from a captive Pacific white-sided dolphin. α-chlordane was not detected in samples from an Altantic whitesided dolphin and a captive Pacific pilot whale. The highest dieldrin level was 4.1 ppm, in the same captive Pacific white-sided dolphin. Aside from humpback and sperm whales, the lowest dieldrin level was 0.2 ppm in a sample from a dense-beaked whale. The captive Pacific white-sided dolphin also had the highest level of total DDT and metabolites, 1023 ppm. Humpback whales and sperm whales had the lowest levels of total DDT and metabolites; the lowest level in any other species was 30.3 ppm in a sample from an Atlantic pilot whale.

78-0760. Archer, T. E. ; Stokes, J. D. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616) **Removal of carbofuran residues from strawberries by various washes and jam production.** *J. Food Sci.* 43(2): 444-445; 1978. (4 references)

A quantitative determination was made of the fate of carbofuran and its metabolites on strawberries subjected to specific chemical and physical treatments during the processing of the strawberries into jam as well as studying the effect of these treatments on the organoleptic qualities of the jam. The separate treatments included washing the strawberries to remove chemical residues with solutions of water, ethanol, sodium bicarbonate, and hydrochloric acid before jam processing. The loss of total residues as determined by gas chromatographic analyses ranged from 63.1% on unwashed berries to as much as 100.0% on specifically processed samples. None of the chemical and/or physical treatments adversely affected the appearance, odor, or flavor of the jam.

78-0761. Wanielista, M. P. ; Yousef, Y. A.; McLellon, W. M. (Florida Technol. Univ., Orlando, FL) **Nonpoint source effects on water quality.** *J. Water Pollut. Control Fed.* 49(3): 441-451; 1977. (24 references)

The results of a project to define the nature and extent of nonpoint source water quality responses are reported. The effects on water quality from nonpoint sources are variable and site-specific studies may be needed. The extent of the studies depends on site conditions, receiving water conditions, and existing regulatory requirements. Information is provided on a procedure to construct instrumentation that can automatically collect water samples in a way that reflects field conditions, water quality response curves related to point and nonpoint sources, and development of loading rates from nonpoint sources for urban and non-urban basins. Results are presented for studies conducted on two basins in central Florida.

78-0762. Aberg, B. (Sveriges Lantbruksuniv., Uppsala, Sweden) **Ograsmedel verkar ofta som naturamnen. [Herbicides often simulate natural materials.]** *Kem. Tidskr.* 90(2): 39; 1978. (Swedish)

Modern herbicides are degraded relatively rapidly in the soil, and they do not tend to accumulate over the trophic chains. As they are used usually at an early stage of the vegetation period, their residues in plants are very low at harvest. Phenoxy acids are degraded fairly rapidly by soil microorganisms. Modern herbicides can be considered as being less hazardous and causing fewer hygienic problems than many natural substances.

78-0763. Levina, Z. V. ; Lyubivaya, A. I.; Berlyant, O. R.; Kabanova, N. N. (Ukrainian Sci. Res. Inst. Canning Ind., USSR) **Vliyanie tekhnologicheskikh protsessov na ostatochnoe soderzhanie vinfosa v ovoshchakh i konservakh. [Effects of processing on vinfos (tetrachlorvinphos) residues in fresh and canned vegetables.]** *Konservn. Ovoshchesush. Prom.* (9): 17-19; 1977. (Russian)

The effects of different processing steps on the tetrachlorvinphos residue levels in cucumbers and vegetable marrow were studied by thin-layer chromatographic residue analysis. The samples were soaked in aqueous suspension of tetrachlorvinphos for 3-5 minutes for artificial contamination. Most of the pesticide was found on the skin, with only traces inside the cucumbers and vegetable marrow. Soaking with washing for 0.5-5 hr reduced the residue levels by 41-71%, blanching at 60°C for 3-5 minutes caused a reduction by 33-63% and subsequent washing for 1 minute by 8-27%. After sterilization the residue level was 14-20% of the original level. The findings indicate the efficiency of the canning technology in the removal of tetrachlorvinphos residues from cucumbers and vegetable marrow.

78-0764. Adir, J. ; Caplan, Y. H.; Thompson, B. C. (Clin. Pharmokinetics Lab., Sch. Pharm., Univ. Maryland, Baltimore, MD 21201) **Kepone serum half-life in humans.** *Life Sci.* 22(8): 699-702; 1978. (9 references)

Blood samples were obtained from twelve Allied Chemical Company plant workers in Baltimore, Maryland who were exposed to unknown amounts of Kepone (chlordecone). The post-exposure serum concentrations of the insecticide were determined by gas chromatography. Serum Kepone concentrations ranging from 120 to 2,109 ng/ml were observed on the last day of exposure. Six to seven months later, the insecticide's concentration dropped to 37-486 ng/ml. The half-life of elimination of Kepone was variable and ranged from a low of 63 to a high of 148 days. No correlation was observed between the half-life and the serum Kepone concentrations on the last day of exposure. (Author abstract by permission)

78-0765. Petrocelli, S. R. ; Anderson, J. W.; Hanks, A. R. (Dep. Biol., Texas A&M Univ., College Stn., TX 77843) **Controlled food-chain transfer of dieldrin residues from phytoplankters to clams.** *Mar. Biol.* 31(3): 215-218; 1975. (27 references)

Algae were grown in seawater containing dieldrin, then resuspended in clean seawater and fed to clams. The dieldrin concentration in the algae averaged 6.12 μg/g dry weight. Allowing for resuspension of the algae in clean seawater, the dieldrin concentration available to the clams was calculated at 1.71 μg/l. After being allowed to feed on the algae for 48 hr, the clams had an average dieldrin concentration of 92.24 μg/kg wet weight. A 24 hr assimilation period after feeding did not significantly change the dieldrin concentration. The magnification factor was calculated at 54 times.

78-0766. Yamashita, T. (Health Survey Sect., Dep. Environ. Health, Environ. Agency, Tokyo, Japan) **[Outline of the survey on environmental presence of chemical substances.]** *Kogai To Taisaku (Environ. Pollut. Countermeasures)* 14(3): 251-260; 1978. (Japanese)

A survey on chemicals in the environment was begun by the Environment Agency 1974. The object of the survey in 1975 was persistent chemicals in the environment, and in 1976 it was those affecting the human body. The results of a survey on DDT and BHC in the aquatic ecosystem (water, bottom sediment and fish) in 1975 gave maximum values respectively of *p,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD, *o,p'*-DDT, and α-, β-, γ-, and δ-hexachlorocyclohexane (BHC) of ND, ND, ND, ND, 0.1, ND, ND and ND μg/l in water, 0.0073, 0.0079, 0.015, ND, 0.01, 0.05, 0.01 and 0.01 μg/g in bottom mud and 0.0013, 0.131, 0.015, 0.0021, 0.015, 0.007, 0.013, and ND μg/g wet weight in fish. It was noted that *p,p'*-DDE and *p,p'*-DDD were found in about half the number of bottom muds and fishes. The results of the survey in 1976 are not reported in detail herein; however, it is reported that organobromine compounds such as methyl bromide were not detected in bottom mud samples.

78-0767. Yamada, T. (Dep. Plantpathol. Insects, Nat. Inst. Agr. Sci. Tokyo, Japan) **[Pesticide residues in soils of crop-growing fields. Especially on amino-derivatives of tri-**

chlorophenyl nitrophenyl ethers.] *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 2(special ed.): 587; 1977. (Japanese)

The results of a country-wide investigation of residues in rice fields of a widely applied herbicide, CNP (*p*-nitrophenyl 2,4,6-trichlorophenyl ether), were summarized. At 5 months after application the detectable residual amount of the active ingredient was low, but when the soil was heat-treated with alkali a large amount of amino-derivative (*p*-aminophenyl trichlorophenyl ether) was isolated and determined. It was presumed that the amino derivative had been mainly bound to humic acids, and under certain conditions it is converted to the free amino derivative or the original nitro compound. The amount of residue of the herbicide, including the amino derivative, was larger in cooler districts than in warmer districts, especially in clay-rich soil and exceedingly moist soils. However, no amino-derivative was detected in unpolished rice grains, and its translocation to straw was low. It was also found that chloroanilines form from many kinds of herbicides which enter into bonds with soil components; the bound residues are highly persistent in soil.

78-0768. Semenchova, E. M. ; Gorbachevs'ka, E. F.; Komarova, L. I. (All-Union Sci. Res. Inst. Pesticides Polymers Plastic Materials, Kiev, USSR) **Protieritrotsitarni antitila i nesitel'stvo khlororganichnikh spoluk porodillyami, shcho ne mali pobutovogo i profesional'nogo kontaketu z khimichnimi rechovanami. [Anti-erythrocyte antibodies and organochlorine compounds in lying-in women who have not been exposed to chemical substances in everyday life and occupationally.]** *Pediatr. Akush Ginekol.* (6): 38-40; 1977. (Ukrainian)

Thirty-six 19-39-year old lying-in women who have neither been exposed to chemical substances in everyday life nor occupationally were investigated for DDT residues. DDT residues of 0.01-0.8 mg/liter were found in the retroplacental blood and milk in 20/26 patients. In 11 women, DDT was found only in the milk in concentrations of 0.05-0.7 mg/liter. The retroplacental blood and milk samples from five women contained no DDT. Anti-DDT antibodies were found in the retroplacental blood at titers of about 1:15 to 1:40. The findings indicate the occurrence of DDT in persons not exposed specifically to pesticides

78-0769. Il'ina, V. I. (All-Union Sci. Res. Inst. Pesticides, Polymers Plastic Materials, Kiev, USSR) **Stan spetsifichnikh funktsiy zhinok, shcho perenesli utruennia na polyakh, obroblenikh polikhlorpinenom. [Status of the specific gynecological functions of women exposed to polychloropinene in the fields.]** *Pediatr. Akush. Ginekol.* (6): 40-41; 1977. (Ukrainian)

The gynecological functions and the incidence of gynecological diseases were studied in women who suffered mild to medium acute poisoning by polychloropinene 1-3 months before on treated fields, and in 155 controls. The poisoned women also had long-term exposure to organochlorine and organophosphorus pesticides. The polychloropinene concentrations in the air did not exceed the MAC value (0.01 mg/m^3) at the time of poisoning. Most women were in the age bracket 20-45 years in both groups. The frequency of disorders in the menstrual cycle was 34.3% versus 2.6% in the control, temporary infertility was found in 13.3% versus 0.6% in the control, inflammation of the uterine appendages in 18% versus 5.1%, erosion of the cervix in 11.3% versus 3.8%, and uterine fibromyoma in 4.8% versus 3.2%. The karyopyknotic index was 40.4% between days 5 and 7 of the menstrual cycle, 39% between the 12th and 14th days and 40.1% between the 19th and 21st days; the corresponding values were 23%, 72% and 30%, respectively, in the control.

78-0770. Baldwin, M. K. ; Bennett, D.; Beynon, K. I. (Shell Toxicol. Lab. (Tunstall), Sittingbourne Res. Cent., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **The concentrations of aldrin and dieldrin and their photoisomers in the atmosphere.** *Pestic. Sci.* 8(5): 431-445; 1977. (19 references)

Air samples taken in 1973 at a point remote from areas of organochlorine pesticide usage, Bantry Bay in S.W. Ireland, were analyzed for aldrin and dieldrin in the vapor state and in association with particulate matter. In addition, some of the samples were analyzed for the photoisomers of aldrin and dieldrin, and for *p,p'*-DDT, *p,p'*-DDE and *p,p'*-TDE. Detection and quantitation of all compounds were by gas-liquid chromatography with electron capture detection. Confirmatory evidence for the presence of dieldrin and *p,p'*-DDE was obtained with some samples using gas-liquid chromatography with mass fragmentographic detection. Dieldrin was detected in all seventeen samples of air taken, but the mean concentration was 0.36 ng/kg and the range of concentrations was 0.06-1.60 ng/kg. Aldrin was not detected in the samples examined, neither were the two photoisomers. Only *p,p'*-DDE of the *p,p'*-DDT group of compounds was detected in the nine samples examined, and the apparent mean concentration was 0.14 ng/kg. None of the compounds was detected in particulate matter. (Author abstract by permission)

78-0771. Smith, A. E. ; Walker, A. (Agric. Canada, Res. Stn., Regina, Sask. S4P 3A2, Canada) **A quantitative study of asulam persistence in soil.** *Pestic. Sci.* 8(5): 449-456; 1977. (15 references)

The persistence of the herbicide asulam was studied at different controlled temperature and moisture levels in Regina heavy clay. Degradation was rapid, approximating to first-order kinetics with a half-life of about 7 days, at temperatures in the range 20-35°C and at moisture of above 50% of field capacity. At lower soil temperature and/or moisture regimens, breakdown was slower. The laboratory data were used in conjunction with the appropriate meteorological records in a computer program to simulate the degradation pattern for asulam in six separate microplot field studies carried out during May to November 1976. In three of the six experiments there was close correspondence between observed and predicted residue levels, but in the other three experiments, the model underestimated rates of loss. (Author abstract by permission)

78-0772. Ripley, B. D. ; Simpson, C. M. (Prov. Pestic. Res. Test. Lab., Ontario Minist. Agric. Food, Univ. Guelph, Guelph, Ont. NIG 2W1, Canada) **Residues of zineb and ethylenethiourea in orchard treated pears and commercial pear products.** *Pestic. Sci.* 8(5): 487-491; 1977. (15 references)

Zineb and ethylene thiourea (ETU) residues were monitored in Bartlett pears after spraying with zineb (5.04 kg a.i./ha). Zineb dissipated seven times faster in the first 10 days after application than in the subsequent days of the study; ETU residues ranged from 0.02 to 0.01 mg/kg over the 21 day trial. A 3-6% conversion of ethylene- bisdithiocarbamate to ETU was found upon boiling treated pears. Analysis of randomly selected commercially canned pears and baby food pear puree showed no zineb residues but ≤ 0.05 mg ETU/kg was present in four of the six samples of baby food. (Author abstract by permission)

78-0773. Kaaijk, J. ; Frijlink, C. (Chem. Lab., TNO, Rijswijk, The Netherlands) **Degradation of *S*-2-di-isopropylaminoethyl *O*-ethyl methylphosphonothioate in soil. Sulphur-containing products.** *Pestic. Sci.* 8(5): 510-514; 1977. (3 references)

The degradation of [^{35}S]-labelled and [^{32}P]-labelled *S* -2-di-isopropylaminoethyl *O*-ethyl methylphosphonothioate has been studied in humic sand, humic loam and clayey peat under laboratory conditions. Radioactivity, which proved to be tightly bound to the soil, was extracted by alkaline methanol. *N,N*-Dithiodiethylenebis(di-isopropylamine) was identified as the only sulphur-containing product in the extract.

78-0774. Roberts, T. R. ; Standen, M. E. (Shell Biosci. Lab., Sittingbourne Res. Cent., Shell Res. Ltd. Sittingbourne, Kent ME9 8AG, England) **Degradation of the pyrethroid insecticide WL 41706, (+)-alpha-cyano -3- phenoxybenzyl 2,2,3,3-tetramethylcyclopropanecarboxylate, in soils.** *Pestic. Sci.* 8(6): 600-610; 1977. (3 references)

The degradation of the insecticide WL 41706, (±)-α -cyano -3- phenoxybenzyl 2,2,3,3-tetramethylcyclopropanecarboxylate, (I), in two soils from Spain and one from the UK has been studied in the laboratory. Samples of (I) labelled separately with ^{14}C in the benzyl ring (uniform labelling) and at C_1 of the cyclopropyl ring were used. The insecticide underwent detradation by hydrolysis at the cyano group to form the amide and carboxylic acid analogues. However, the major degradative rout was hydrolysis at the ester linkage, leading initially to the formation of 3-phenoxybenzoic acid and 2,2,3,3-tetramethylcyclopropanecarboxylic acid. When a sandy clay soil was treted with [benzyl-^{14}C]-WL 41706 under balance conditions, $^{14}CO_2$ was evolved at a steady rate and 16% of the applied radiolabel was detected as $^{14}CO_2$ over a 26 week period. The rate of degradation of I was most rapid on a moist sandy clay (loss of 50% initial quantity in 4 weeks) but it was considerably slower on dry sandy clay and moist clay soils (> 16 weeks). Under flooded, anaerobic conditions the rate of hydrolysis of the insecticide was slower than that under aerobic conditions and the 3-phenoxybenzoic acid and 2,2,3,-3-tetramethylcyclopropanecarboxylic acid were found to accumulate over the 24 weeks of the experiment. (Author abstract by permission)

78-0775. Leroux, P. ; Casanova, M.; Dachaud, R. (Lab. Phytopharm. CNRA, INRA, 7800 Versailles, France) **Etude de la penetration et de la persistance du benomyl et du carbendazime chez des pommes traitees apres la recolte. [Penetration and persistence of benomyl and of carbendazim in apples treated after harvest.]** *Phytiatr. Phytopharm.* 24(1): 49-56; 1975. (6 references) (French)

Freshly harvested apples (Golden Delicious) were immersed in benomyl solution (0.5 g/liter) for 1 or 10 minutes, and their benomyl + carbendazim content was determined spectrophotometrically after up to 56 days storage at 2°C in darkness. The residue levels (expressed as carbendazim) measured in apples immersed in benomyl for 1 minute were 0.75 mg/kg of fresh weight after 3 days and 0.66 mg/kg after 56 days, which indicates the persistence of benomyl. Immersion for 10 minutes caused only about 25% increase in the residue level. The residue was concentrated mainly in the skin (0.14-3.77 mg/kg), only 0.03-0.15 mg/kg was found in the flesh. The residue levels were highest around the stalk and the eye.

78-0776. Scotto La Massese, C. ; Mars, S. (Stn. Rech. Nematodes, INRA, Antibes, France) **Etude preliminaire des residus de brome dans les cultures faites dans des sols ayant recu des applications de brome mineral K Br et organique CH_3Br. [Bromine residues in crops grown in soils treated with potassium bromide and methyl bromide.]** *Phytiatr. Phytopharm.* 24(1): 57-65; 1975. (French)

The effects of soil treatment with methyl bromide and potassium bromide on the bromine residues in the plants grown in the treated sandy clayey soil were studied. Methyl bromide was applied in doses of 50 and 75 g/m^2, potassium bromide in doses of 61 and 91 g/m^2. The bromine residue levels found in the plants were about 6 times as high after soil treatment with methyl bromide as after treatment with potassium bromide. Additional soil treatment with potassium sulfate (70 g/m^2) reduced the bromine residue level in the plants to about half. After treatment with methyl bromide the bromine residues were highest in the skin of potatoes (2,650 ppm relative to dry matter after treatment with 50 mg/m^2 and 3,015 ppm after treatment with 75 g/m^2), in the haulms of carrots (2,570 and 2,830 ppm), in the pulp of potatoes (950 and 1,600 ppm) and of carrots (1,490 and 1,275 ppm), in the epidermis of carrots (780 and 346 ppm), in onions (363-1,430 ppm), 486 ppm in lettuce, and in leeks (208 and 430 ppm), but the residue levels found in kidney beans were below 50 ppm. Lettuce grown as aftercrop 1 month later contained 213-920 ppm of bromine.

78-0777. Jamet, P. ; Piedallu, M.-A. (Lab. Phytopharm., INRA, 78000 Versalles, France) **Mouvement du carbofuran**

dans differents types de sols: Etude de l'adsorption et de la desorption du carbofuran. [Migration of carbofuran in different types of soil: study of the adsorption and desorption of carbofuran.] *Phytiatr. Phytopharm.* 24(4): 279-296; 1975. (11 references) (French)

The adsorption and desorption of ^{14}C-labeled carbofuran were studied in different types of soils with organic matter contents ranging from 0.03% (sand) to 18.98% (compost). The adsorption was found to be completely reversible, and most intense during the first few days only to slow down later. Significant positive correlation was found between the organic matter content of the soil and the adsorption of carbofuran. The easy migration of carbofuran in the soil is explained by its reversible adsorption.

78-0778. Grega, T. ; Barowicz, T. (Inst. Zootech., Krakow, Poland) **Przenikanie do mleka chemicznych zanieczyszczen srodowiska. [Environmental chemicals in milk.]** *Post. Nauk Roln.* 163(2): 95-110; 1977. (72 references) (Polish)

General problems and studies concerning residues of pesticides, drugs and heavy metals in cow milk are reviewed. About 3-5% of the pesticides entering the body of the cow are excreted in the milk. In humans, this percentage ranges from 1 to 10%. The acceptable daily intake determined by the WHO/FAO is 0.0125 mg/kg for lindane, 0.0001 mg/kg for aldrin + dieldrin, 0.0005 mg/kg for heptachlor + heptachlor epoxide, and 0.005 mg/kg for total DDT. The corresponding maximal levels in human tissues are 0.2, 0.15, 0.15 and 1.0 mg/kg.

78-0779. Rosenberg, D. M. (Dep. Entomol., Univ. Alberta, Edmonton, Alberta T6G 2E3, Canada) **Food chain concentration of chlorinated hydrocarbon pesticides in invertebrate communities: a re-evaluation** *Quaest. Entomol.* 11: 97-110; 1975. (70 references)

Literature on chlorinated hydrocarbon pesticides in invertebrate food chains is reviewed. In one locality *Gammarus* sp. contained 0.029 ppm of DDT and its analogs, as compared to 0.016 ppm in predatory *Sialis* sp. and 0.024 ppm in the predator *Limnephilus rhombicus.* Dieldrin residues in *Gammarus* sp., *Sialis* sp., and *Limnephilus rhombicus* were 0.003, 0.013, and 0.002 ppm, respectively. *Gammarus* sp. contained 0.025 ppm endrin, as compared to 0.009 ppm in *Sialis* sp. and 0.003 ppm in *Limnephilus rhombicus.* In the Rocky River, South Carolina, predaceous hellgrammite larvae exposed to a dieldrin industrial effluent contained 1.2 ppm dieldrin, as compared to 16.2 ppm in filter-feeding blackfly and 19.0 ppm in filter-feeding caddisfly larvae. Mirex residues in herbivorous aquatic invertebrates in Mississippi ranged from zero in lake organisms in the Starkville area to 1.01 ppm in the Louisville and Noxapater areas. Mirex residues in carnivorous aquatic invertebrates ranged from 0.10 ppm in the Louisville and Noxapater areas to 0.47 ppm in Bluff Lake. Residues in omnivorous aquatic invertebrates ranged from 0.06 ppm in Bluff Lake to 1.33 ppm in lake organisms in the Starkville area. The reported concentrations of chlorinated hydrocarbon pesticides do not indicate a trophic level effect.

78-0780. Simsiman, G. V. ; Daniel, T. C.; Chesters, G. (Dep. Soil Sci., Water Res. Cent., Univ. Wisconsin, Madison, WI 53706) **Diquat and endothall: Their fates in the environment.** *Residue Rev.* 62: 131-174; 1976. (166 references)

The fate of the widely used herbicides, diquat and endothall, in various organisms and systems as well as their toxicity to animals are reviewed. Preferential adsorption of diquat by organic matter and by clay minerals, particularly montmorillonite, significantly reduces microbial and photochemical degradation in soils and aquatic environments. Diquat residues remaining on plant surfaces may undergo photodegradation. Plant-absorbed diquat is not metabolized, but its accumulation in harvested crops is negligible due to limited absorption. Diquat absorbed by mammals is readily excreted, largely as metabolites. The pathways of diquat degradation should be further elucidated. Endothall is mobile in soil; it is rapidly degraded by microbes to nontoxic products in soils and aquatic systems. Its persistence in soil may be prolonged by adsorption to organic matter or by factors inhibiting microbial activity. An initial study of the microbial metabolic pathway of endothall has shown that endothall is incorporated mainly into glutamic acid through the tricarboxylic cycle after splitting of the oxabicyclo ring. Limited results indicate that endothall absorbed by plants and fish is completely metabolized, but in mammals it is excreted largely as the bound form. Inadequate methods of determining low levels of endothall in soils and sediments appear to limit extensive investigations regarding the ecological fate of the herbicide. The acute toxicity levels of diquat and endothall to mammals, fish, and several species of invertebrates are well above the recommended dosages for weed control. No chronic effects have been observed at recommended rates. (Author abstract by permission, abridged).

78-0781. Dep. Child. Homes, Minist. Welfare, Tokyo, Japan **[On the epidemiological investigation of the environmental pollution of human milk by PCB and other chemicals.]** *Rinsho Eiyo (J. Clin. Nutr.)* 52(1): 85-89; 1978. (Japanese)

Contents of PCB, BHC, DDT and dieldrin in milk of lactating women, the state of their health and that of their babies were investigated from July to Aug. 1976 on 258 specimens in 60 districts in 31 Prefectures. The average total BHC content was 0.080, with a high of 0.999 ppm; it was higher in urban areas than in rural areas. However, as compared to the results in recent years the reduction in urban district was remarkable. The average total DDT content was 0.065 with a high of 0.598 without significant differences between areas and to the past results. The average content of dieldrin was 0.0025 with a high 0.014 ppm. Compared to present results, a gradual reduction is seen in urban areas and an increase is seen in rural areas. The lactating women and their children were divided into 3 groups according to the contents of PCB, BHC, DDT and dieldrin; it was found that the contents were

higher in primiparas. However, no special relationship could be found between the pesticide concentration and the state of health either of the women or their babies.

78-0782. Takeshita, T. ; Inuyama, T.; Yoneda, T.; Goto, M. (Shimane Prefect. Inst. Public Health Environ. Sci., Matsue, Shimane Prefecture, Japan) **[Results of survey on environment-polluting substances in foods.]** *Shimane-ken Eisei Kogai Kenkyusho Kenkyu Nenpo (Annu. Rep. Shimane Prefect. Inst. Public Health Environ. Sci.)* 18: 124-131; 1976. (Japanese)

A survey was conducted on pesticide residues in fresh foods such as vegetables, meats, cow's milk, fish and shellfish in Shimane Prefecture in 1976. Specimens were examined for 18 pesticides. Total BHC was found in all ten samples of rice grain examined at trace to 0.002 ppm, total DDT was found in only one sample of rice grain at 0.001 ppm, and dieldrin (including aldrin) was found in only one out of 9 samples of cucumber. No other pesticides were detected in any of 58 samples of 15 kinds of vegetables. The average contents of α-, β-, and γ-BHC, *p,p'*-DDD, -DDT, and -DDE, and dieldrin (including aldrin) in 23 samples of cow's milk were 0.0016, 0.0017, 0.0002, 0.0002, 0.0004, 0.0005 and 0.0004 ppm on a whole milk basis. The survey in 1975 showed no DDT residues in rice. However, BHC was found in some tea samples, captan in some cucumber samples, and no other pesticides in all samples of the same number as in 1976. Pesticide residues in cow's milk showed no tendency toward reducing after 1974 except for BHC. No data was published on pesticide residues in fish and in shellfish.

78-0783. ApSimon, J. W. ; Yamasaki, K.; Fruchier, A.; Chau, A. S. Y. (Dep. Chem., Carleton Univ., Ottawa, Ontario, Canada) **Carbon-carbon bond cleavage in an epoxide. A minor product from the acid treatment of endrin.** *Tetrahedron Lett.* (41): 3677-3680; 1977. (5 references)

A number of compounds were prepared during a systematic NMR spectral examination of the transformation products of the polychlorocyclodiene insecticides. On treatment of endrin with sulfuric acid, a particular product (6-8%) was consistently formed in addition to ketoendrin. Examination of the NMR and infrared spectra suggested a symmetrical molecule without the epoxide group present in endrin. Absence of the characteristic CLC = CCl stretching frequency at 1600 cm^{-1}, as well as the absence of a carbonyl or hydroxyl group, was also indicated by the infrared spectrum. A structure is proposed for the molecule on the basis of these results. The formation of this molecule involves C-C cleavage of the epoxide followed by cycloaddition with a dichloroolefin. Such a process may proceed via a carbonyl yield, or, alternatively, via a pathway utilizing acid catalysis. The proximity of the dichloroolefin to the strained epoxide in the cage system of endrin undoubtedly plays the major directing role in the reaction. Reaction of the compound with excess lithium aluminum hydride yielded another compound, which was also analyzed by NMR and infrared spectrometry.

78-0784. Lee, G. F. ; Hughes, R. A.; Veith, G. D. (Cent. Environ. Stud., Univ. Texas Dallas, Richardson, TX 75080) **Evidence for partial degradation of toxaphene in the aquatic environment.** *Water Air Soil Pollut.* 8: 485-490; 1977. (9 references)

The partial degradation of toxaphene in the aquatic environment was studied. Bioassay of residual toxaphene demonstrated reduced toxicity to bluegills of 'weathered' toxaphene compared to the commercial formulation. These findings, coupled with the results of other studies, clearly show that there appears to be some degradation of some of the more toxic components of toxaphene with respect to fish when this compound is placed in the aquatic environment. These results suggest the difficulty in interpreting the significance of toxaphene residue analyses of environmental samples.

78-0785. Fusi, P. ; Cecconi, S.; Franci, M.; Vazzana, C. (Ist. Chim. Agrar. For., Univ. Firenze, Cent. Stud. Colloidi Suolo, CNR, Firenze, Italy) **Adsorption et desorption de la pyrazone par quelques colloides organiques et mineraux. [Adsorption and desorption of pyrazon by some organic and mineral colloids.]** *Weed Res.* 16(2): 101-109; 1976. (25 references) (French)

The adsorption and desorption of pyrazone on organic and mineral colloids and on ion-exchanging resins saturated with H^+, Na^+, K^+, Ca^{++} and Mg^{++} ions were studied. The following order of adsorption was found for H-adsorbents: H-Amberlite > Dowex-H > H-humus > Al,H-montmorillonite > Al,H-illite > Al,H-kaolinite. This adsorption, which seems to be due to physical links and not to protonation mechanisms, is greater than that found with the -K, -Na, -Ca, and -Mg systems. With Ca-systems the same order of adsorption was obtained: Dowex-Ca > Ca-montmorillonite > Ca-illite > Ca-kaolinite. In contrast to what was found with Dowex resin, with montmorillonite and illite the saturating cation seemed to affect adsorption of pyrazon; indeed the following order was obtained: $Ca^{++} > Mg^{++} > K^+ > Na^+$. For all the systems we examined desorption of the adsorbed pyrazone was complete. (Author abstract by permission)

78-0786. McGrath, D. (Dep. Soil. Biol., Johnstown Castle Res. Cent., Agric. Inst., Wexford, Ireland) **Factors that influence the persistence of TCA in soil.** *Weed Res.* 16(2): 131-137; 1976. (16 references)

The persistence of TCA in soil was examined using the pyridine-alkali colorimetric procedure. Loss of TCA was essentially similar when determined by colorimetry, chloride release or bioassay. Persistence of TCA when incubated with soil at 25°C or sprayed on the soil surface in the field was slightly influenced by soil type. Degradation of TCA occurs largely by microbial action after a lag phase. Soils treated with TCA acquire the ability to degrade further additions of

the compound without a lag phase. The three soils examined still possessed this ability to differing extents 32 months after they had been sprayed once with TCA at the rate of 22.4 kg/ha. In one experiment the persistence of TCA was shortened appreciably in a plot that had twice previously been sprayed with TCA. (Author abstract by permission)

See also 78-0785, 78-0790, 78-0855, 78-0870, 78-0908, 78-0920, 78-0926, 78-0948, 78-0454, *and* 78-0987.

78-0787. Felice Semidey, J. R. (Div. Control Contam., Ambiental, Venezuela) **Efectos biologicos de los pesticidas.** [Biological effects of pesticides.] *Bol. Dir. Malariol. Saneamiento Ambiental* 15(3/4): 124-128; 1975. (Spanish)

The biological effects of organophosphorus and organochlorine pesticides on warm-blooded animals are reviewed. Organophosphorus pesticides, whose LD_{50} ranges from 1 to 4,000 mg/kg in mammals, produce a cholinergic syndrome with tremor, paralysis, and death due to the inhibition of cholinesterase. Anticholinergic substances, such as atropine, and reactivators are the antidotes of organophosphorus pesticides. DDT and related compounds form complexes with the nerve cell membrane, which causes an alteration of its permeability for ions and conductivity. These compounds also combined with cholesterol in the altered cells. While organochlorine pesticides preferably accumulate in the fatty tissues, they are also metabolized through oxidation, reduction or dehydrochlorination. They inactivate certain enzymes, such as oxidases and deoxidases in nerve cells, which leads to inadequate elimination of carbon dioxide from the cells and to increased irritability of the brain cortex. The result is clinically manifested as sensory and motor disturbances (tinnitus, photopsia, myoclonus, convulsions, and tetany). Barbiturates are efficient but nonspecific antidotes for DDT and related compounds.

78-0788. Grandjean, P. (Inst. Hyg., Univ. Copenhagen, Copenhagen, Denmark) **Possible effect of lead on egg-shell thickness in** kestrels **1874-1974.** *Bull. Environ. Contam. Toxicol.* 16(1): 101-106; 1976. (14 references)

Twelve clutches containing a total of 69 kestrel eggs from the years 1874-1953 and 11 clutches containing a total of 25 unhatched kestrel eggs from the years 1972 to 1974 were analyzed for pollutants. The median DDE content of the newer eggs was 16 μg/g fat, and the range was 0.3 to 42 μg/g fat. The median dieldrin concentration of the newer eggs was 0.95 μg/g fat, and the range was 0.20 to 5.9 μg/g fat. In these eggs the Kendall rank correlation coefficient between shell thickness and DDE concentration in the egg content is -0.37, and that between shell thickness and dieldrin is -0.41. The DDE and dieldrin concentrations are strongly related. There was no significant difference between the lead contents of the new and old eggs; shell thickness partially masks the effect of chlorinated pesticides.

78-0789. Anonymous **Drug speeds up body's removal of kepone.** *Chem. Eng. News* 56(6): 4; 1978.

Results of animal tests and clinical trials show that treatment with cholestyramine, an anion exchange resin used as a cholesterol-reducing drug, doubles the rate of Kepone (chlordecone) excretion and causes its levels in blood and fat to decrease at twice the rate found in untreated animals or humans. Twenty-two former employees of the Hopewell, Va. company that manufactured Kepone were studied. Initially 11 of their former employees were unable to work because of neurological disorders. After six months of treatment with cholestyramine, only three are still unable to work. It was decided that cholestyramine, which binds bile salts and enhances their excretion, might be useful when it was discovered that much of the Kepone converted into bile by the liver was apparently being reabsorbed in the intestine. So far, the only patients treated with cholestyramine have been those with very large exposures to Kepone. Initial results indicate that cholestyramine may be effective for a wide range of chlorinated compounds, including some that are not excreted in bile.

78-0790. Capen, D. E. (Utah State Univ., Logan, UT 84321) **The impact of pesticides on the white-faced ibis.** *Diss. Abstr. Int. B* 38(8): 3532; 1978.

The white-faced ibis (*Plegadis chihi*) which nested in northern Utah was assessed as a species with a relatively low reproductive potential. White-faced ibises commonly laid eggs with cracked or broken shells from 1968 through 1971, but the incidence of aberrant eggs decreased after 1971. By 1974, no significant difference was found between the current mean eggshell thickness and the thickness of eggshells collected before 1940 and preserved in museums. Also, in 1974, less than 1% of nests surveyed contained cracked eggs. White-faced ibises in Utah again laid thin-shelled eggs in 1975 and 1976. Cracked eggs were found in about 30% of nests examined during both of these years, and the means of eggshell thickness were significantly less than in 1974. A high incidence of cracked eggs was associated with less than 10 percent thinning of eggshells. Eggshell thickness of white-faced ibis eggs collected in 1975 was significantly related, linearly and negatively, to the logarithms of DDE residues of the eggs. The comparison of this relationship to those of other species indicated that the white-faced ibis is especially sensitive to eggshell thinning. DDE residues were found in samples of blood serum, breast muscle, and subcutaneous fat of white-faced ibises collected in 1974 and 1975. The logarithm of DDE in blood serum was positively correlated with ln DDE in fat and with ln DDE in muscle. DDE levels in blood serum were related to lipid mobilization and varied by season and between sexes. (Author abstract by permission)

78-0791. Haley, T. J. ; Reichert, E. R.; Klemmer, H. W. (NCTR, Jefferson, AR 72079) **Acute human poisoning with parathion and mevinphos.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 247; 1978.

A 42-yr-old Japanese farmer developed symptoms of malaise, fatigue, profuse diaphoresis, nausea and dizziness 2 hr after the agitator hose broke on his mist blower and filled his boots with mevinphos emulation. He had sprayed for 30 min with mevinphos and 2 hr with parathion. Although he wore protective clothing, he rapidly developed abdominal cramping, giddiness, weakness and chills. He went to sleep after bathing with soap and water. When symptoms persisted on the following day, he received 2 mg of atropine IM with cessation of all symptoms. Blood and urinary metabolites of the pesticides and cholinesterase in RBC and plasma were measured with the pH stat method. Parathion metabolites were diethylphosphate (0.14-0.28 ppm, blood) and monoe-

thylphosphate (0.14-0.55 ppm, blood and 5.7-7.0 ppm, urine). Mevinphos metabolites were monomethylphosphate (0.11 ppm, blood) and dimethylphosphate (2.0 ppm, urine). Cholinesterase values varied from 7.5 to 10 in RBC and from 2.7 to 4.5 in plasma. Urinary metabolites of parathion persisted longer than those of mevinphos. Continued exposure was finally terminated by destruction of the contaminated boots. The efficacy of monitoring pesticide metabolites has been demonstrated in determining chronic exposure and its degree.

78-0792. Lipshultz, L. I. (Univ. Tex. Health Sci. Cent. Houston, Texas Med. Cent., Houston, TX) **Dibromochloropropane and its effect on testicular function.** *Fertil. Steril.* 29(2): 243; 1978.

The incidence of subfertility was found to be extremely high among workers at two chemical plants. Both facilities produced 1,2-dibromo -3- chloropropane (DBCP), a nematicide. The exposed group and an in-house, unexposed, control group were examined, and medical histories were taken. Semen analyses and radioimmunoassays of serum luteinizing hormone, follicle-stimulating hormone, and testosterone were performed. The germinal epithelium in man has not previously been evaluated as a possible target tissue for toxins in the industrial environment. DBCP has several possible mechanisms of action.

78-0793. Strateva, A. (Hyg. Cent., Acad. Med., Sofia, Bulgaria) **Eksperimental'noye obosnovaniye predel'no dopustimykh kontsentratsiy propakhlora (ramroda) v vodakh. [Experimental substantiation of maximum permissible propachlor (Ramrod) concentrations in water.]** *Gig. Sanit.* (4): 85-87; 1976. (3 references) (Russian)

A determination of the adverse effects of Ramrod in organ systems and water reservoirs at threshold and subthreshold concentrations was made. High oral dosage acute toxicity tests were made on rats, rabbits and mice. Rats were studied for long-term effects and results indicate that there is a low cumulative and a high adaptive effect of Ramrod with characteristic clinical changes and pathomorphological dystrophic changes in the liver and kidneys. LD50 values were 950 (860-1050) mg/kg for rats, 392 (272-565) mg/kg for rabbits and 290 (240-350) mg/kg for mice. Threshold and subthreshold doses for warm-blooded animals were established and an extrapolation of the subthreshold dose for humans was made; 5 mg/kg, 0.5 mg/kg and 0.05 mg/kg, respectively. Permissible Ramrod concentrations in water reservoirs are suggested to be 1 mg/l for potable water and fish hatcheries, while 20k mg/l is recommended as an upper limit for irrigation purposes.

78-0794. Sandermann, W. ; Eggensperger, H.; Diehl, K. H. (Fa. Schulte & Mayr GmbH., Robert Kochstr. 2, 2000 Norderstedt 2, Germany) **Chemische Konstitution und fungizide Wirksamkeit. [Chemical constitution and fungicidal effectiveness.]** *Holzforschung* 31(5): 148-159; 1977. (31 references) (German)

Toxicological aspects of pentachlorophenol (PCP) and its impurities are reviewed, and screening for fungicidal wood preservatives are described. Commercial PCP contains approximately 10% of highly chlorinated phenols and chlorinated diphenyl ethers, furanes and dibenzodioxines, with hexachlorodibenzodioxine (HCDD) being the most toxic of all these impurities. It causes acne, and had teratogenic effects. However, even pure PCP is hazardous environmentally, because it forms considerable amounts of hexachlorobenzene on pyrolysis. PCP also forms octachlorodiphenyldioxine on its pyrolysis; this substance appeared to be rather harmless in short-term experiments, but its long-term effect is unknown.

78-0795. Basak, P. K. ; Konar, S. K. (Dep. Zool., Kalyani Univ., Kalyani 741235, West Bengal, India) **A new method for the determination of safe concentrations of insecticides to protect fishes.** *Indian J. Environ. Health* 19(4): 283-292; 1977. (17 references)

A method was developed to determine the safe levels of pesticides using 168 hour static bioassays. The method was evaluated using the chlorinated hydrocarbon thiodan, (endosulfan) and three species of fish. The safe application rate of thiodan was determined by multiplying the median lethal dose by a factor SAFE. This latter factor was estimated by dividing the concentration at which none died by the concentration at which all died in 168 hours. The estimated safe application rates for carp, singhi and tilapia were 0.000184, 0.000628, and 0.000280 ppm, respectively. Tests were conducted both in the laboratory and in outdoor conditions to evaluate the safety of the estimated levels. At these levels the fish showed normal feeding behavior, growth and reproduction.

78-0796. FitzGerald, G. R. ; Barniville, G.; FitzPatrick, P.; Edwards, A.; Silke, B.; Carmody, M.; O'Dwyer, W. F. (Monaghan Hosp., Monaghan, Ireland) **Adrenal abnormalities in paraquat poisoning. An indication for corticosteroid therapy?** *Ir. J. Med. Sci.* 146(12): 421-423; 1977. (6 references)

The adrenal glands of 23 patients who died of paraquat poisoning were examined. Complete necrosis occurred in the seven cases in which the patients survived from 2 to 4 days. The amount of 20% paraquat concentrate ingested, where known, varied from 100 ml to 500 ml. Focal necrosis was found in the five patients, who had survived from 4 to 10 days. The amount of 20% paraquat concentrate ingested was unknown in one case and varied from 10 ml to 100 ml in the others. In the other 11 cases, in which the patients survived from 2 to 21 days the adrenal glands were normal. The amount of 20% paraquat concentrate ingested, where known, was 20 ml or 30 ml. All of these patients died from either cardiorespiratory collapse or progressive respiratory insufficiency. Although corticosteroids did not affect the outcome of these fatal cases, they may be useful as replacement hormonal therapy in cases of paraquat poisoning.

78-0797. Fox, I. ; De Leon, D. D. (Author address not given) **Adverse reactions caused by insecticide--not flea collar.** *J. Am. Vet. Med. Assoc.* 171(2): 149-151; 1977.

A letter-to-the-editor criticizes published letters by veterinarians about flea collars for pets for not referring to the specific insecticide used. Flea collars may contain either dichlorvos, naled, or tetrachlorvinphos. Formal toxicity data on these compounds is needed for cats. In some places, at least, use of dichlorvos in flea collars is decreasing. To properly evaluate flea collars, veterinarians must recognize the various insecticides used.

78-0798. Gastel, B. ; Innis, R.; Moses, H., III (Author address not given) **Thallium poisoning.** *Johns Hopkins Med. J.* 142(1): 27-31; 1978. (8 references)

A 35-year-old woman was hospitalized with symptoms of hair loss and painful, weak legs. She also experienced numbness in the hands and feet, nausea, visual impairment, and difficulty in concentrating, which had begun three weeks previously. Thallium intoxication was confirmed by a urinary thallium level of 3100 μg/L. The treatment administered was potassium chloride, 15 cc of a 10% solution, given orally every eight hours. The patient's condition became worse, with complete loss of reflexes in her legs and more pain within days of beginning KCl therapy at a dosage of 45 meq/day. This sometimes occurs in cases of thallium poisoning, probably due to displacement of intracellular thallium into the free pool. A thorough search by public health investigators failed to discover the source of exposure. The patient's urinary thallium concentrations decreased consistent with a half-life of 30 days, and by three months, her paresthesia had lessened, and motor function was returning in her feet.

78-0799. Voronova, L. D. (Cent. Lab. Environ. Prot., USSR Minist. Agric., USSR) **Pobochnoye deystvie pestitsidov v nazemnykh i vodnykh zootsenozakh. [Side-effects of pesticides on terrestrial and aquatic zoocenoses.]** *Khim. Sel'sk. Khoz.* 15(11): 44-49; 1977. (42 references) (Russian)

Recent studies carried out in the USSR on the effects of pesticides on the terrestrial and aquatic fauna are presented. Massive deaths were observed in the wild fauna due to acute poisoning with rat poisons, mercurials, arsenicals, organochlorine pesticides, and 2,4-D butyl ester. The study of the environmental distribution and persistence of carbaryl revealed the presence of this pesticide in all components of the flora and fauna, its accumulation along the trophic chains, as well as a reduction of the populations of small rodents, hares and moles in the biocenoses investigated. The application of 2,4-D butyl ester in a single dose of 3.5-7 kg/ha in forests led to the reduction of the entire population and of the percentage of young animals in warm-blooded and cold-blooded zoocenoses. All components of the biocenosis contained 2,4-D butyl ester and its metabolites after the treatment. Experiments with breasts of prey fed small rodents poisoned with the rat poison,gliftor,showed general poisoning symptoms and occasional death. Field experiments revealed long-term changes in the soil fauna under the effect of carbamates, and only short-term effect of organophosphorus pesticides.

78-0800. Nielsen, E. F. (Hemodialysis Unit, Morristown Mem. Hosp., Morristown, NJ) **Charcoal hemoperfusion for insecticide overdose.** *Lancet* 1(8062): 506; 1978. (3 references)

A letter-to-the-editor reports treatment for overdose of the insecticide oxychlordane which is toxic to the liver, kidneys, lungs, heart, and central nervous system and it is highly fat soluble. Hemodialysis and peritoneal dialysis do not remove it effectively. A 35-yr-old man ingested about 90 g of chlordane in a suicide attempt. Hemoperfusion was done at 200 ml/min for 4 hr using a 'Hemocol' 300 g acrylic encapsulated activated charcoal column. Oxychlordane concentrations were 1800 ppb before hemoperfusion, 676 ppb immediately afterward, and 481 ppb 4 days later in contrast to the usual 3 months half life for oxychlordane. The patient experienced no further symptoms. There was no increase in blood-urea or liver enzymes. Charcoal absorption reduced the platelet-count to 110,000/μl immediately after hemoperfusion.

78-0801. Heidt, J. H. (Dade City Mosq. Contr. Div., Miami, FL 33178) **Salvaging insecticide drums.** *Mosq. News.* 35(4): 564; 1975.

Open head 30-gallon drums used to ship insecticides such as Dibrom (naled) may be reused as trash containers or storage bins, if the plastic liner is removed before the drum is reused. A garden hose can be used to float the liner out with water in about one minute. Removing the metal lid is necessary before removing the liner.

78-0802. Jones, D. M. ; Bennett, D.; Elgar, K. E. (Zool. Soc. London, Regents Park, London NW1, England) **Deaths of owls traced to insecticide-treated timber.** *Nature (London)* 272(5648): 52; 1978. (2 references)

Between March 1974 and September 1976, 55 owls, an unusually large number, died at the Zoological Society of London. In 27 of the cases, death could be attributed to causes other than poisoning; postmortem findings in the other 28 owls were limited to congested livers and kidneys. Since no potential poisons were used near the owls, the possibility of a toxic substance in the food was investigated. Twenty-four of these 28 owls were fed almost exclusively on laboratory mice; deaths among owls fed mostly rats were limited to owls already in poor condition. The geometric mean dieldrin concentration in owl liver was 24 μg/g, and that in owl brain was 15 μg/g. Except for the two lowest dieldrin values, these concentrations were similar to those in quail and pigeon which died as a result of dieldrin feeding in a previous study. The ratio of dieldrin to *p,p'*-DDE concentrations in owl liver was much greater than that in wild birds, indicating that the owls had been exposed to the dieldrin while at the zoo. Geometric means of dieldrin concentration were 0.6 μg/g in the mice, 0.007 μg/g in the mouse diet, 0.02 μg/g in the owl's

bedding, and 94 μg/g in the mice's bedding. The mice's bedding was sawdust from a builder who used a timber preservative containing dieldrin. The dieldrin residue in the sawdust, but not in the mouse diet, was sufficient to cause the concentrations in the mice, which were sufficient to account for the residues in the owls. Two owls deposited at the zoo by UK Customs died at the zoo before having fed; their livers contained 41 and 26 micrograms/g of dieldrin, which was attributed to a source other than the mice.

78-0803. Anonymous. **Kepone trying.** *New Sci.* 77(1091): 485; 1978.

Cholestyramine has been used in the successful treatment of workers poisoned by kepone (chlordecone). Severe poisoning was discovered in 50 workers in a factory producing kepone in Virginia, resulting in the closing of the factory. Twenty-two of these workers participated in the trials of cholestyramine treatment. Without treatment, about 90% of the kepone secreted from the liver via bile is re-absorbed in the intestine. Cholestyramine causes more rapid excretion of kepone by binding to the kepone and preventing it from being reabsorbed. Cholestyramine treatment markedly reduced kepone levels in the blood, fat, and liver of the 11 workers originally treated and produced similar results in the other 11 workers when they were later switched from a placebo to cholestyramine. The lower kepone levels were accompanied by reductions in symptoms of kepone poisoning.

78-0804. Alha, A. ; Karlsson, M.; Koskinen, L. (Rattskem. Avdelning., Helsingfors Univ. Raettmed. Inst., SF-00280 Helsingfors 28, Finland) **Forgiftningar med dodlig utgang i Finland 1966-1976. [Fatal poisonings in Finland 1966--1976.]** *Nord. Med.* 93(1-2): 33-36; 1978. (9 references) (Swedish)

Statistical data are presented on fatal poisonings in Finland in 1976. A total of 573 cases were recorded, of which 12 accounted for poisoning with cholinesterase inhibitors. All 12 cases were suicides. The poison was identified to be parathion in 8 cases, dimethoate in 3 and propoxur in 1. The incidence of fatal poisonings by cholinesterase inhibitors has shown a steady decline since 1958, when it reached 102 cases. Fatal poisoning was caused by thallium and arsenic in one case each.

78-0805. Stringer, A. ; Lyons, C. H. (Long Ashton Res. Stn., Univ. Bristol, Bristol BS18 9AF, England) **The effect on earthworm populations of methods of spraying benomyl in an apple orchard.** *Pestic. Sci.* 8(6): 647-650; 1977. (10 references)

Compared with high volume (2240 l/ha) sprays, low (560 l/ha) and ultra-low volume (45 l/ha) sprays of benomyl were less toxic to earthworms. The decrease in populations was proportional to the quantity of fungicide deposited on the ground; regression lines, probit (% reduction) on log (fall out in g/ha), are given for populations of *Lumbricus terrestris* and all species together. The reduction in numbers was similar for all species except *L. terrestris* and *Allolobophora longa*. *L. terrestris* was more susceptible to the deposits than the other species; *A. longa* was less affected, probably because it was in summer diapause. (Author abstract by permission)

78-0806. Lipa, J. J. ; Trojanowski, H. (Inst. Ochrony Roslin, Poznan, Poland) **Badania nad wplywem pestycydow na pozyteczna mikroflore i faune pol uprawnych i sadow w Polsce. [Study on the effect of pesticides on the useful microflora and fauna of farmlands and gardens in Poland.]** *Postepy Nauk Roln.* 24(2): 77-94; 1977. (77 references) (Polish)

A review of the effects of pesticides on the beneficial microflora and fauna of cultivated acreage is presented. The pesticides involved belonged to the chlorinated hydrocarbon, organophosphate, carbamate, and mercurial group. Attention was given to reducing their harmfulness by the choice of appropriate formulations, method of application, and determination of the proper time for their use. The effect of herbicides on the soil microflora varied from temporary inhibition to stimulation; fungicides had an adverse effect on actinomycetes and fungi. No clear-cut reductive or stimulating action on the number of arthropods or soil-dwelling invertebrates by pesticides was established. Insecticides proved to be very toxic (100% mortality) to the larvae of ladybugs (Coccinellidae) while fungicides displayed little or no toxicity to their eggs and larvae. Parasitic and other beneficial hymenoptera, which are ecologically very important, showed high sensitivity to most pesticides. Golden-eyed flies (Chrysopidae) demonstrated varying sensitivity at different stages of development, and larvae of stage 1 revealed the highest mortality from all pesticides. A similar finding applied to predatory heteroptera, except that adult insects were more sensitive to insecticides than their larvae. In the case of predatory mites (Phytoseiidae), the effects of pesticides, depending on the climatic conditions, compounds used, or species of mite, could be positive or negative. The toxicity of many agents to honey bees was shown to depend on the temperature. Arsenic preparations applied against potato beetles killed birds, such as partridges and starlings. No observable changes were noted with DDT. No harmful effect on hares or deer was seen with chlorinated hydrocarbons, although residues, as in the birds, could be determined in their tissues.

78-0807. Harmison, L. T. (Public Health Serv., DHEW, Washington DC 20201) **Toxic substances and health.** *Public Health Rep.* 93(1): 3-10; 1978.

The major health problems in industrialized nations are aggravated by environmental factors. Prevention is more promising than curative medicine for dealing with these health problems. Although pesticides are not covered by the Toxic Substances Control Act, Congress has passsed amendments to the Federal Insecticide, Fungicide and Rodenticide Act. Pesticide applications introduce lead, mercury, cadmium, and barium into the environment. Chlorinated organic pesticides, the group to which DDT, Kepone, mirex, and endrin belong, include some carcinogenic substances and some that cause nervous system complications. Many workers at

the Life Science Products Company plant in Hopewell, Virginia, which produced Kepone (chlordecone), developed symptoms of Kepone poisoning. Kepone discharged by the plant entered the lower James River and its tributaries. Enormous environmental problems resulted. No shortcuts exist for removing a toxic chemical from a large river or contaminated sludge.

78-0808. Epstein, S. S. (Sch. Public Health, Univ. Illinois Med. Cent., Chicago, IL 60612) **Kepone--hazard evaluation.** *Sci. Total Environ.* 9(1): 1-62; 1978. (25 references)

Safety precautions for handling Kepone (chlordecone) include use of heavy synthetic rubber gloves, mechanical ventilation or a respirator, immediate washing if Keone comes in contact with the skin, and avoiding contamination of food. Blood levels of Kepone in Hopewell, Virginia residents decreased approximately linearly with increasing distance from the factory manufacturing Kepone. Blood levels of Kepone averaged 8.48 ppm in employees of the factory who showed symptoms of Kepone poisoning and 1.57 ppm in asymptomatic employees. *In vitro* studies indicated that Kepone inhibited beef liver glutamate dehydrogenase, AT-Pase activity in channel catfish brain, and rabbit muscle lactate dehydrogenase. Prolonged exposure to Kepone concentrations over 0.031 ppm is dangerous to the aquatic environment. Kepone stimulates development of the oviduct in immature quail on a reduced photoperiod but not mature quail. When mice were placed on a control diet after 90 days on a diet containing 40 ppm Kepone, Kepone residues ranged from 160 μg/g in the liver to 6.0 μg/g in the kidney at the start of the control diet. After 24 days on the control diet, residues ranged from 59 μg/g in the liver to 1.0 μg/g in the kidney.

78-0809. Ahling, B. (Swedish Water Air Pollut. Res. Lab., S-100 31 Stockholm, Sweden) **The combustion of waste containing DDT and Lindan [sic].** *Sci. Total Environ.* 9(2): 117-124; 1978. (10 references)

A pilot combustion facility was used to investigate incineration of pesticides. The pesticides were dissolved in isopropanol, and LP-gas was used as support fuel. Unburned lindane ranged from 8.7 mg/kg initial feed, obtained with incineration for 4.6 sec at 800°C, to 62.3 mg/kg initial lindane feed, obtained when the lindane was mixed with sawdust and wood chips. In experiments with DDT, transit times of less than 1 sec markedly increased the amount of DDT remaining. When transit time was increased to about 1.4 sec at a temperature of 800°C, emissions were reduced to 0.7 mg DDT/kg DDT feed. At 3.2 sec at 800°C, emissions were further reduced to 0.5 mg DDT/kg DDT. At 700°C, 100 mg DDT/kg was emitted after a transit time of about 0.8 sec and 3.2 mg/kg after 1.8 sec. When residues of *p,p'*-DDT and *p,p'*-DDE are combined, incineration for about 0.8 sec produced a residue of 500 mg/kg at 800°C. Increasing the transit time to about 1.4 sec reduced the combined residue to 5 mg/kg. At 700°C a transit time of 0.7 sec produced a combined residue of about 6500 mg/kg. Increasing the transit time to 2 sec produced a combined residue of about 53 mg/kg.

78-0810. Clark, D. R., Jr. ; LaVal, R. K.; Swineford, D. M. (Patuxent Wildl. Res. Ctr., US Fish Wildl. Serv., Laurel, MD 20811) **Dieldrin-induced mortality in an endangered species, the gray bat (*Myotis grisescens*).** *Science* 199(4335): 1357-1359; 1978. (19 references)

Twenty-eight juvenile gray bats found dead in three caves in Missouri were analyzed for dieldrin. Ten of the 12 bats found dead in the first cave were presumably killed by dieldrin. Dieldrin concentrations in the brain reached as high as 10 ppm in the bats killed by dieldrin. Dieldrin was not detected in the brain of one of the bats killed by other causes. Dieldrin levels in carcass fat were 200 ppm in both bats killed by other causes and ranged from 239 ppm to 1050 ppm in bats killed by dieldrin. Three bats were killed by dieldrin in the second cave; dieldrin residues in their brains ranged from 2.7 ppm to 8.4 ppm. The brain of a fourth bat from this cave contained 0.63 ppm dieldrin; the cause of death is unknown. None of the 12 bats from the third cave was killed by dieldrin; they may have been killed when the roost was disturbed by a predator. Dieldrin was not detected in the brains of nine of these bats, and the highest dieldrin residue in the brain was 0.61 ppm.

78-0811. Makarov, V. A. ; Repin, V. M. (Moscow Acad. Vet. Sci., Moscow, USSR) **Vetsanekspertiza tush i organov otravivshikhsya zhivotnykh. [Examination of carcasses and organs of poisoned animals.]** *Veterinariya (Moscow)* (9): 96-98; 1977. (Russian)

General regulations and procedures concerning the sanitary inspection of the carcasses and organs of acutely poisoned animals are presented. The meat of poisoned animals is usually of dark red color, the fat is pink, the liver and gallbladder enlarged, and hyperemia and hemorrhage may be observed in the liver, kidneys, heart, brain, spinal cord, stomach, intestines and lungs. The lungs are usually edematous. A yellow color of the mucosa is characteristic of arsenic poisoning. Copper compounds cause enlargement of the kidneys, while TMTD (thiram) often causes atrophy of the spleen. The carcasses and organs of animals poisoned with aldrin, heptachlor, dichloralurea, polychloropinene (strobane), mercurials, methyl bromide, DDT, BHC, octamethyl, mercaptophos, metaphos, thiophos, dicresyl, carbaryl, TMTD, zineb, and arsenic compounds are unfit for human consumption. The carcasses of animals poisoned with other organophosphorus compounds are fit for consumption if the residues are below the maximum allowable levels.

78-0812. Kaskevich, L. M. ; Soboleva, L. P.; Blekherman, N. A. (Clin. Dep., All-Union Res. Inst. Hyg. Toxicol. Pestic. Polym. Plastics, Kiev, USSR) **Vyyavlenie doklinicheskikh izmeneniy pri vozdeystvii khimicheskikh faktorov vneshney sredy. [Detection of preclinical changes during effects of chemical environmental factors.]** *Vrach. Delo.* (11): 128-131; 1977. (Russian)

Preclinical changes were studied in 109 healthy persons living in an area with extensive use of organochlorine pesticides (group 1) and in 119 control persons living in an

area where the amount of pesticides used was about 10 times lower. Both groups included some persons who were exposed to the pesticides occupationally. The frequency of diffuse changes of the myocardium was 54.3% in occupationally exposed person vs. 33.3% in the general population in group 1, vs. 67.7% and 32.2% in the control. Ballistocardiographic examinations revealed tendency toward reduced amplitude of the systolic and diastolic waves in intensely exposed persons. The ECG and BCG examinations revealed preclinical signs of myocardiac dystrophy. Tendency toward hypotension was seen in group 1. Significant reduction of the intrahepatic circulation was found in group 1. The SGPT activity was increased in 7.5% in the control, and 12.6% of the probands in group 1. The SGOT activity was increased in 3.2% and 15.5%, respectively. These biochemical changes were associated with impaired intrahepatic circulation in 13/46 occupationally exposed persons in group 1. The red cell autoagglutinin formation and the immunocompetent cell counts in the blood were increased in group 1. The findings indicate the significant influence of the extent of pesticide use on the incidence and intensity of preclinical changes.

78-0813. Fairshter, R. D. (Dep. Med., Univ. California Irvine, Orange, CA) **Paraquat poisoning: an update.** *West. J. Med.* 128(1): 56-58; 1978. (18 references)

According to an editorial, the survival rate following paraquat poisoning has been estimated at 50 to 65%. If paraquat has been ingested, immediate attempts should be made to minimize absorption of the compound, accelerate its excretion, and modify the tissue effects of absorbed, nonexcreted paraquat. Following gastric lavage, repeated doses of Fuller's earth are given concurrently with cathartics every few hours for at least 48 to 72 hours after ingestion. Gastrointestinal washout has recently been advocated. Early attempts to enhance paraquat excretion probably should employ a combination of forced diuresis and hemodialysis or hemoperfusion. Measures to modify tissue toxicity are directed toward minimizing lung damage. They include administration of superoxide dismutase to catalyze the reaction of the superoxide anion, a harmful radical formed by reaction with paraquat, and subatmospheric oxygen concentrations.

78-0814. Robin, E. D.; Raffin, T. A.; Pickersgill, J.; Theodore, J.; Laman, P. D.; Simon, L. M. (Dep. Med., Sch. Med., Stanford Univ., Stanford, CA 94305) **Paraquat ingestion and pulmonary injury.** *West. J. Med.* 128(1): 26-34; 1978. (18 references)

A 47-year-old man suffering from advanced metastatic, poorly differentiated adenocarcinoma ingested paraquat. When he was hospitalized 2 days later, peritoneal dialysis was instituted due to the lack of adequate diuretic response. A catharsis was initiated. The patient died on the third hospital day; microscopic examination of the lungs showed areas of hemorrhage, edema, acidophilic material, and macrophages in the alveoli. This was a classic presentation in the case of paraquat ingestion: early pain and ulcerations in mouth, esophagus, and stomach, followed by acute renal failure and respiratory insufficiency several days later. The areas of metastatic carcinoma were probably more prone to develop pulmonary edema after paraquat ingestion due to the altered pulmonary architecture. Paraquat is localized in lung tissue. The delayed pulmonary involvement resembling the adult respiratory distress syndrom (ARDS) is a common sequence. There is extensive evidence linking the toxic effects of paraquat with increased generation of oxygen free radicals.

See also 78-0719, 78-0720, 78-0722, 78-0731, 78-0768, *and* 78-0894.

78-0815. Fitzek, A. (Dep. Pharmacol. Toxicol., Sch. Vet. Med., Free Univ., Berlin, West Germany) **Pharmacokinetics of 2-pivaloylindan-1,3-dione in dogs.** *Acta Pharmacol. Toxicol.* 42(2): 81-87; 1978. (19 references)

Female mongrel dogs, one to 2 yr old, were given a single dose of 3 or 5 mg/kg 2-pivaloylindan-1,3-dione (pindone) either by capsule or intravenously. Plasma concentration of 2-pivaloylindan-1,3-dione increased rapidly from about 4 μg/ml 30 min after oral administration to a maximum of over 10 μg/ml after 13 hr. Plasma concentration then declined in a log linear manner. Plasma concentration also declined in a log linear manner after an initial maximum of slightly over 20 μg/ml following administration by injection. Plasma concentrations had decreased to between 5 and 6 μg/ml 150 hr after oral administration and between 8 and 9 μg/ml 150 hr after injection. At dosages of 3 mg/kg, maximum prothrombin times of 41.1 sec and 24 sec occurred slightly over 100 hr after oral and intraveneous administration, respectively. Both the increase and the decrease in prothrombin times were log linear, and prothrombin times increased more rapidly than they decreased. The highest 2-pivaloylindan-1,3-dione concentration was 11.3 μg/ml in the blood of a dog that died 132 hr after oral administration of 5 mg/kg. The lowest concentration in this dog was 0.7 μg/g in the brain.

78-0816. Gupta, P. K. ; Chandra, S. V.; Saxena, D. K. (Industrial Toxicol. Res. Cent., Lucknow, India) **Teratogenic and embryotoxic effects of endosulfan in rats.** *Acta Pharmacol. Toxicol.* 42(2): 150-152; 1978. (12 references)

Endosulfan was tested in rats for possible teratogenic and embryotoxic effects. Endosulfan was given orally from day 6 through day 14 of gestation in doses of 0.0, 5.0, and 10.0 mg/kg. No marked changes in behavior and appearance were noted in females receiving endosulfan. Body weight was comparable to that of controls. An increase was noted in maternal toxicity, with a 5.0 to 10.0 mg/kg dose increasing dam mortality. Enlargement of the uteri was noted which could be due to the effect on the female sex hormones. The fetal resorption rate in rats treated with endosulfan ranged from 20 to 22.8%, compared to 5.5% in controls. The incidence of skeletal abnormalities was 24.9-31.0% in endosulfan-treated animals, compared to 19.9% in controls. The significance of the most commonly observed skeletal defect, the fourteenth rib, is detatable.

78-0817. Ando, M. ; Nakagawa, M.; Nakamura, T.; Tomita, K. (Sankyo Co., Ltd., Agric. Chem. Res. Lab., 2-58, 1-chome, Hiromachi, Shinagawa-ku, Tokyo, Japan) **Metabolism of isoxathion, *O,O*-diethyl *O*-(5-phenyl -3- isoxazolyl)-phosphorothioate in the rats.** *Agric. Biol. Chem.* 39(4): 803-809; 1975. (5 references)

Excretion, distribution and metabolism of the insecticide, Isoxathion, administered orally in male Wistar-strain rats, were investigated with a carbon-14 labeled chemical. During 96 hr, approximately 85% and 14% of the total radioactivity were excreted in the urine and feces. Distribution of isoxathion after oral administration in the rats was investigated by means of whole-body autoradiographic technique and measurement of radioactivity in the tissues. At least eleven radioactive metabolites were detected, four of which were structurally determined. They were 3-hydroxy-5-phenylisoxazole, 3-(β-D-glucopyranuronosyloxy) -5- phenylisoxazole, 5-phenyl -3- isoxazolyl sulfate and hippuric acid.

78-0818. Nakagawa, M. ; Ando, M. (Agric. Chem. Res. Lab., Sankyo Co. Ltd., Yasugun, Shigaken, Japan) **Metabolism of credazine, 3-(2′-methylphenoxy)pyridazine, in rats.** *Agric. Biol. Chem.* 41(10): 1975-1984; 1977. (22 references)

A single oral dose of credazine, 3-(2′- methylphenoxy)pyridazine-6-^{3}H, to male Wistar rats at 10 and 100 mg/kg was eliminated in 4 days and was metabolized through oxidative pathways. 3-(2′-Hydroxymethylphenoxy)pyridazine, 3-phenoxypyridazin-2′-yl-carboxylic acid, 3(2H)-pyridazinone and the sulfate of 3-(2′-methyl -4′- hydroxyphenoxy)pyridazine were identified as urinary metabolites. The tritium label was retained by more than 95% during metabolism. Among the metabolites the alcohol and carboxylic acid derivatives were found to be labile: the former isomerized to 10H-pyridazino[3,2-b] [1,3]benzoxazinium hydroxide, and the latter decomposed to 3(2H)-pyradazinone and salicylic acid. Any enzymatic cleavage of the ether bond of credazine and its metabolites was not evident.

78-0819. Palmer, J. S. (Vet. Toxicol. Entomol. Res. Lab., ARS, USDA, College Station, TX 77840) **Toxicologic evaluation of a microencapsulated formulation of methyl parathion applied dermally to cattle.** *Am. J. Vet. Res.* 39(3): 429-431; 1978. (8 references)

Calves and 2- to 3-yr old cattle were sprayed with 4 l of a slurry of polymeric microcapsules containing methyl parathion. The microcapsules contained 22% methyl parathion. Calves were sprayed with concentrations of 0.01%, 0.025%, 0.05%, 0.1%, 0.25%, and 0.5%. The older cattle were sprayed with concentrations of 0.1%, 0.25%, and 0.5%. One of two calves sprayed with the 0.05% slurry showed symptoms of poisoning. The only other calves showing symptoms of poisoning were the two sprayed with the 0.5% slurry. One of these calves had anorexia, ataxia, and salivation but recovered without therapy. The other had anorexia after 24 hr and later died. Two of the three older cattle sprayed with 0.25% had diarrhea the day after treatment and recovered the next day; the third was unaffected. All three older cattle sprayed with 0.5% had severe diarrhea and anorexia. The older cattle sprayed with 0.1% showed no symptoms of poisoning. The older cattle sprayed with 0.1%, 0.25%, and 0.5% slurries experienced weight loss of 8.2%, 7.2%, and 10.2%, respectively. The control heifer expericenced a 1.5% weight loss, attributed to the stress involved in collecting daily blood samples.

78-0820. Eroschenko, V. P. (Dep. Biol. Sci., Univ. Idaho, Moscow, ID) **Morphological alterations in the testes of the**

Japanese quail during and after the ingestion of the estrogenic insecticide Kepone. *Anat. Rec.* 190(2): 391; 1978.

Six-week-old male Japanese quail were fed a diet contaminated with 200 ppm Kepone (chlordecone) for 42 days. Both enlargement and atrophy of the testes resulted. In enlarged testes, the seminferous tubules were dilated and filled with abnormal cellular debris, the germinal epithelium was disrupted, and sperm production was affected. Spermatogenesis appeared suppressed, and the germinal epithelium contained curled, abnormal sperm in atrophic testes. The excurrent ducts either contained few sperm or contained degenerating cellular debris. When Kepone dogase was stopped, gradual structural reparations and increased sperm concentrations resulted, although not always bilaterally. The reproductive capabilities of some quail were severely limited by the prolonged heavy doses of Kepone.

78-0821. Wood, P. A. ; MacRae, I. C. (Dep. Microbiol., Univ. Queensland, St. Lucia, 4067 Australia) **Reduction of fensulfothion to fensulfothion sulfide by *Klebsiella pneumoniae*.** *Appl. Environ. Microbiol.* 34(3): 247-250; 1977. (6 references)

Within 12 hr of incubation a cell suspension of *Klebsiella pneumoniae* converted most of the organophosphorus pesticide fensulfothion to a product that was shown by chemical oxidation, gas-liquid chromatography, infrared spectrophotometry, and mass spectrometry to be fensulfothion sulfide. Further alteration of this metabolite was not noted to a significant extent. (Author abstract by permission, supplemented)

78-0822. Goerz, G. ; Vizethum, W.; Bolsen, K.; Krieg, T.; Lissner, R. (Univ. Hautklin. Duesseldorf, Biotest Serum Inst., Frankfurt/Main, Germany) **Influence of chlorinated benzene derivatives on liver cytochrome P-450 and on urinary porphyrin excretion.** *Arch. Dermatol. Res.* 26(1): 94; 1978.

The effect of pentachlorophenol (PCP), a metabolite of HCB, and pentachlorobenzene (PCB) on the enzymatic activity of cytochrome P-450 and urinary porphyrin excretion was studied. Adult female Wistar rats were fed a diet containing 0.5% HCB, 0.05% PCB, or 0.05% PCP for 70 days. The urinary excretion of porphyrins and precursors was determined at precise intervals. Two days after the administration of HCB a strong rise of the microsomal *O*-deaklylation activity was noted, which after manifestation of the HCB-induced porphyria was further increased about 20-fold compared to controls. PCP and PCB produced a lower increase of the *O*-dealkylation of 7-ethoxycumarin, but were found to have no effect on the urinary excretion of the porphyrins and their precursors.

78-0823. Morgan, D. P. ; Hetzler, H. L.; Slach, E. F.; Lin, L. I. (Dep. Prevent. Med. Environ. Health, Coll. Med., Univ. Iowa, Iowa City, IA 52240) **Urinary excretion of paranitrophenol and alkyl phosphates following ingestion of methyl or ethyl parathion by human subjects.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 159-173; 1977. (14 references)

Nitrophenolic and alkyl phosphate metabolites of methyl and ethyl parathion appear in the urine of human subjects soon after doses of 1 to 4 mg have been ingested. Particular alkyl phosphates can serve as specific indices of absorption of the respective parathions. Paranitrophenol and diethyl thiophosphate are rapidly eliminated in the urine, while excretions of dimethyl phosphate, and particularly diethyl phosphate, are more protracted. Cumulative excretions of paranitrophenol and alkyl phosphates exhibit sufficient dose-dependence at convenient intervals following parathion ingestion to encourage use of metabolite measurements in estimating occupational absorption of the parathion insecticides. (Author abstract by permission)

78-0824. Rumsey, T. S. ; Miller, R. W.; Dinius, D. A. (USDA, Beltsville, MD 20705) **Residue content of beef feedlot manure after feeding diethylstilbestrol, chlortetracycline and ronnel and the use of stirofos to reduce population of fly larvae in feedlot manure.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 203-212; 1977. (22 references)

Two beef cattle feedlot experiments were conducted to determine the amount of certain agricultural chemicals that are likely to be found in both fresh and stored feedlot manure and to investigate fly control in this manure. In experiment 1, diethylstilbesterol (DES), chlortetracycline (CTC), and ronnel were used as feed additives. Fresh manure, stored manure, runoff water, manure weathered on pasture, and soil from pasture fertilized with manure were analyzed for these additives. Stirofos (tetrachlorvinphos) was added to fresh manure as a larvicide for fly control. In experiment 2, the residue aspects of DES and CTC were repeated. In this experiment, stirofos instead of ronnel was fed with DES and CTC. Sixty-eight percent of the DES fed to cattle appeared in fresh manure and 52% in manure stored for 12 weeks. Comparable percentage values were 17 and 11% for CTC and 13 and 3% for ronnel; somewhat less DES and CTC were found when a concentrate diet was fed. Detectable amounts of DES, CTC, and ronnel were not found in runoff water, weathered manure, or soil. Adding an emulsifiable concentrate formulation of stirofos directly to manure at a rate of approximately 45 ppm of wet manure completely controlled the larvae of house fly (*Musca domestica* L.) whereas feeding stirofos at a rate of 1.5 mg per kg of body weight daily reduced larval counts 82% in manure from forage-fed heifers and 63% in manure from concentrate-fed heifers. Stirofos was not detected in runoff water, weathered waste, or soil. (Author abstract by permission)

78-0825. Fergin, T. J. ; Schafer, E. C. (Denver Wildl. Res. Cent., US Fish Wildl. Serv., Denver, CO 80225) **Toxicity of dieldrin to bobwhite quail in relation to sex and reproductive status.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 213-219; 1977. (10 references)

In a study of dieldrin toxicity to breeding and nonbreeding bobwhite quail (*Colinus virginianus*), breeding birds

of both sexes on long photoperiods were more susceptible to dieldrin poisoning than nonbreeding birds, although some differences were not statistically significant at the .10 level. Shortened photoperiods caused gonadal regression, weight loss, and additional mortalities among dieldrin-treated birds previously in breeding condition. Dieldrin did not influence food consumption, body weight, or egg production until about a week or less before death of individual birds. Dieldrin brain residues were higher among birds that died during the study than among survivors sacrificed at its termination. Among those that died, neither dieldrin treatment level, reproductive status, nor sex seemed related to brain residue levels. Nevertheless, within those factors, levels were slightly higher in the birds that died later in the test. (Author abstract by permission)

78-0826. Watanabe, P. G. ; Sharma, R. P. (Toxicol. Curriculum, Dep. Vet. Sci., Utah State Univ., Logan, UT 84322) **Tri-*o*-tolyl phosphate neurotoxicity: lack of evidence for autoimmunologic involvement.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 233-240; 1977. (22 references)

Studies on the involvement of autoimmunity in the pathogenesis of tri-*o*-tolyl phosphate (TOTP) induced neurotoxicity in chickens were conducted. Immunosuppressive therapy including γ-radiation and drug treatments was utilized to determine its effects on the neurotoxic syndrome. Whole-body γ-irradiation up to 1020 roentgens failed to show any consistent protection from the TOTP induced paralysis. Therapy involving prednisone alone or in combination with 6-mercaptopurine and antilymphocyte serum likewise indicated no protection. Stimulation of humoral and cellular immunity by TOTP was investigated. Complement fixation, precipitation tests, splenic migration inhibition, and skin tests did not indicate stimulation of autoimmunity toward nervous tissue or liver. The present investigation was unable to demonstrate primary involvement of an autoimmune nature in the neurotoxicity produced by TOTP in the chicken. (Author abstract by permission)

78-0827. Schafer, E. W., Jr. ; Brunton, R. B.; Cunningham, D. J.; Lockyer, N. F. (Denver Res. Cent., US Fish Wildl. Serv., Lakewood, CO 80225) **The chronic toxicity of 3-chloro-4-methyl benzamine HCl to birds.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 241-248; 1977. (20 references)

3-Chloro-4-methyl benzamine HCl (DRC-1339), an avian toxicant, was fed to five species of birds for periods up to 120 days. The 30-day LC50 of uniformly treated feed for starlings was 4.7 ppm and the 90-day LC50 was 1.0 ppm. The 28-day LC50 for coturnix was 18 ppm. The 30-day LC50 for pigeons was less than 100 ppm. Pheasants fed diets containing 2% DRC-1339 baits diluted to a rate of 286 ppm of DRC-1339 died within 22 days. Bobwhite quail fed similar diets suffered some mortality at levels as low as 2.9 ppm, but most survived 10 times this dosage level for the 120-day test period. Application of the Kenaga "Index of Chronicity", resulted in the conclusion that DRC-1339 was cumulatively toxic to birds. Reproduction in coturnix was adversely affected by treatments at 10 ppm of DRC-1339 and above. Reproduction in pigeons was adversely affected by a treatment of 25 ppm. In coturnix, DRC-1339 caused an increased incidence of egg breakage and decreased both egg and live chick production. In pigeons, DCR-1339 caused an increase in the proportion of infertile eggs. Reproductive ability of first generation offspring was not affected when parent coturnix and pigeons were fed DRC-1339. These data emphasize the need for care in the use of DRC-1339. The bait should be used only as registered and care exercised in storage and disposal of unused baits to avoid poisoning of nontarget species. (Author abstract by permission)

78-0828. Longcore, J. R. ; Stendell, R. C. (Patuxent Wildl. Res. Cent., US Fish Wildl. Serv., Laural, MD 20811) **Shell thinning and reproductive impairment in Black Ducks after cessation of DDE dosage.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 293-304; 1977. (27 references)

Captive black ducks (*Anas rubripes*) were fed dietary DDE [1,1-dichloro-2,2-*bis* (*p*-chlorophenyl) ethylene] at 10 ppm (dry weight; about 2 ppm on a natural diet basis) for 2 breeding seasons, then untreated feed for 2 succeeding years. Residues of DDE in the carcasses of adults declined 90% during the 2-year clean-up period. Following 2 years of dietary DDE, mean residues in eggs reached 64.9 ppm. Even after 2 years on clean feed, DDE residues in the eggs averaged 6.2 ppm or 9.5% of the mean DDE level reached after 2 years on treated feed. Shells of eggs from treated hens were about 20% thinner than shells of eggs from controls. Stoppage of DDE dosage resulted in progressively thicker shells, yet even after 2 years on untreated feed hens laid eggs with shells about 10% thinner than control hens. After DDE was removed from the diet, DDE residues in the eggs decreased, shell thickness increased, and reproductive success improved. Hens previously exposed to DDE, but then fed clean feed for 2 years, still produced significantly fewer surviving ducklings than did control hens. (Author abstract by permission)

78-0829. Yang, C. F. ; Sun, Y. P. (Prot. Cent. Taiwan, Taichung Hsien, Taiwan) **Partition distribution of insecticides as a critical factor affecting their rates of absorption from water and relative toxicities to fish.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 325-335; 1977. (14 references)

Loaches, *Misgurnus anguillicaudatus* (Cantor), a common fish in Taiwan, were treated with DDT, dieldrin, and monocrotophos by continuous exposure in aqueous solutions (or suspensions) and by injection. DDT and dieldrin were 150 and 220 times more toxic, respectively, than monocrotophos, to the fish exposed in aqueous solutions (24-hr LC50), but only 1/9 and 1/4 as toxic as monocrotophos by injection (24-hr LD50). Results of GLC analyses indicate that, at the end of 24-hr exposure, 96.5% of DDT, 92.7% of dieldrin, and 14.3% of monocrotophos were absorbed by loaches from aqueous solutions. The initial rates of absorption for DDT and dieldrin were about 10 to 20 times faster than that for monocrotophos. The large differences in relative toxicity may be due to partition distribution which in turn

caused differences in absorption, as DDT and dieldrin are lipophilic and monocrotophos is hydrophilic. Statistical analysis of the relationship between fish toxicity and partition coefficients supports the present finding. The coefficient of correlation is 0.70 between partition coefficients (benzene/water) and toxicity to fish (rainbow trout) of 12 organophosphorus insecticides, 0.74 between coefficients and corrected fish toxicities, and 0.96 between partition coefficients and correlated fish toxicities for organophosphates only. Results of analyses are significant at < 1% probability level. Similar correlation was also obtained between partition coefficients for hexane/water and toxicities of 8 organophosphorus and 5 organochlorine insecticides to rainbow trout. (Author abstract by permission)

78-0830. Schimmel, S. C. ; Patrick, J. M., Jr.; Forester, J. (Environ. Res. Lab., US EPA Sabine Island, Gulf Breeze, FL 32561) **Toxicity and bioconcentration of BHC and lindane in selected estuarine animals.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 355-363; 1977. (21 references)

Flow-through, 96-hr bioassays were conducted to determine the acute toxicity of technical BHC and lindane to several estuarine animals. Test animals and their respective 96-hr lindane LC50 values were: mysid (*Mysidopsis bahia*), 6.3 μg/L; shrimp (*Penaeus duorarum*), 0.17 μg/L; grass shrimp (*Palaemonetes pugio*), 4.4 μg/L; sheepshead minnow (*Cyprinodon variegatus*), 104 μg/L; and pinfish (*Lagodon rhomboides*), 30.6 μg/L. The 96-hr LC50 values for pink shrimp and pinfish exposed to BHC were 0.34 and 86.4 μg/L, respectively. Two BHC bioconcentration studies were conducted with the oyster, *Crassostrea virginica*, and pinfish. After 28 days exposure, oysters bioconcentrated an average of 218 X the BHC measured in exposure water, oysters bioconcentrated an average of 130 X in their edible tissues and 617 X in offal. After one week in BHC-free sea water, no detectable residues were measured in oysters or pinfish. (Author abstract by permission)

78-0831. Mauck, W. L. ; Olson, L. E.; Hogan, J. W. (Fish Pestic. Res. Unit., La Crosse, WI 54601) **Effects of water quality on deactivation and toxicity of mexacarbate (Zectran) to fish.** *Arch. Environ. Contam. Toxicol.* 6(4): 385-393; 1977. (24 references)

Mexacarbate (Zectran) is a carbamate insecticide that has been considered for controlling forest insect pests, particularly in northern conifer forests. The effects of different water characteristics (temperature, hardness, and pH) and aging (deactivation) on its toxicity to coho salmon (*Oncorhynchus kisutch*), Atlantic Salmon (*Salmo salar*), brown trout (*Salmon trutta*), fathead minnows (*Pimephales promelas*), bluegills (*Lepomis macrochirus*), and yellow perch (*Perca flavescens*), were determined. Identification and toxicity of the breakdown products were also investigated. Mexacarbate was less toxic to eggs than to other life stages of fish. Water temperature and hardness did not affect its biological activity, but pH did: the insecticide was 38 times more lethal to bluegills at pH 9.5 than at pH 6.5. Solutions of mexacarbate hydrolyzed to more toxic breakdown products during the first 3 weeks of aging; the rate of hydrolysis increased as alkalinity increased. The breakdown product 4-amino-3,5-xylenol was 70 times more lethal to bluegills than mexacarbamate in 96-hr bioassay tests at pH 7.5. However, this breakdown product is apparently not present in sufficient concentrations or long enough to cause fish mortality when the insecticide is applied at rates recommended for control of forest insects. (Author abstract by permission)

78-0832. Moore, R. ; Toro, E.; Stanton, M.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois, Chicago Circ., Chicago, IL 60680) **Absorption and elimination of ^{14}C-*alpha*- and *gamma*-chlordane by a freshwater alga, daphnid, and goldfish.** *Arch. Environ. Contam. Toxicol.* 6(4): 411-420; 1977. (37 references)

The bioconcentration of chlordanes by fresh water food chain organisms gave values of 5,560 for algae, 24,000 for daphnids, and 162 for goldfish. The transfer of preexposed daphnids and goldfish to insecticide-free water resulted in up to 90% elimination of the absorbed/adsorbed dose in 7 and 11 days, respectively. Tissue distribution of chlordane suggests that the biliary pathway of excretion, along with elimination through the gill, kidney, and feces, may be important in the elimination of lipophilic hydrocarbons by fish. (Author abstract by permission)

78-0833. Ledoux, T. A. ; Lodge, J. R.; Touchberry, R. W.; Francis, B. M. (Dep. Dairy Sci., Univ. Illinois, Urbana-Champaign, IL) **The effects of low dietary levels of DDT on breeding performance in hybrid mice.** *Arch. Environ. Contam. Toxicol.* 6(4): 435-446; 1977. (19 references)

A combination of breeding experiments was used to study the effects of various levels of dietary DDT on the reproductive efficiency in mammals. The results of feeding B6D2F_1 hybrid mice 5, 10, or 20 ppm of DDT in the first breeding experiment showed an increase in litter size and number weaned over controls. Ten ppm of DDT caused increases over controls in the number born and alive on day 1 ($P < 0.05$). DDT caused decreases in the weight of pups at 5 ppm on days 15 and 30 ($P < 0.05$ and 0.01, respectively), at 10 ppm on day 15 ($P < 0.005$), and at 20 ppm on day 30 ($P < 0.05$). A second breeding experiment using 30, 60, or 120 ppm of DDT showed a general detrimental effect on reproduction. Thirty ppm DDT-fed animals produced fewer pups than controls ($P < 0.01$) at days 1, 15, and 30, and the pups weighed less than controls at 30 days of age ($P < 0.05$). DDT at 120 ppm resulted in fewer mice at birth and at 30 days of age ($P < 0.01$) than control diet. The third, fourth, and fifth breeding experiments involved diets with 0, 5, 10, and 20 ppm of DDT and with the addition of a 40-ppm level in the third and fourth studies. The data showed larger litter sizes on days 1, 15, and 30 for DDT-fed animals. This investigation indicates that 5, 10, 20, or 40 ppm of DDT in the diet often results in large litter sizes and more pups weaned than controls. Animals fed levels of 30, 60, or 120 ppm of DDT generally produced fewer offspring than did control animals.

DDT-fed mice often weighed less before weaning than control pups. Although variable responses were found, it appears from these studies that environmental levels of DDT are not detrimental to the reproductive efficiency of mice and may under certain circumstances be beneficial. (Author abstract by permission)

78-0834. Hassan, A. ; Abdel-Hamid, F. M.; Mohammed, S. I. (M. E. Reg. Radioisot. Cent., Dokki, Cairo, Egypt) **Metabolism of ^{14}C-leptophos in the rat.** *Arch. Environ. Contam. Toxicol.* 6(4): 447-454; 1977. (14 references)

The metabolic fate of leptophos [*O*-(4-Bromo- 2,5-dichlorophenyl) *O*-methyl phenyl phosphonothioate] in the rat was investigated *in vivo*, using ^{14}C-phenyl and ^{14}C-methyl-labeled insecticide. Following the administration of a single oral dose of ^{14}C-phenyl leptophos (15 mg/kg) 46 to 75% of the ^{14}C-activity was recovered after nine days, in the urine. No radioactivity was eliminated in the expired air. *O*-methyl phenylphosphonic, *O*-methyl phenylphosphonothioic and phenylphosphonic acids were identified among the urinary metabolites, together with two metabolites of unknown nature. Demethylation of leptophos and/or its oxygen analog occurred *in vivo* to a small extent, as confirmed by the elimination of $^{14}CO_2$ in the expired air, from ^{14}C-methyl leptophos. The insecticide seemed to accumulate in omental and subcutaneous fat since traces were still found in fat 12 weeks after administration of the chemical. A study of the kinetics of acetylcholinesterase inhibition revealed that the oxon was the most potent inhibitor. The degradation products were generally weak inhibitors. (Author abstract by permission)

78-0835. Allred, P. M. ; Strange, J. R. (Dep. Biol., Emory Univ., Atlanta, GA 30322) **The effects of 2,4,5-trichlorophenoxyacetic acid and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on developing chicken embryos.** *Arch. Environ. Contam. Toxicol.* 6(4): 483-489; 1977. (18 references)

Analytical grade 2,4,5-T and TCDD were dissolved in acetone and injected into the airspace of fertile chicken eggs. Toxicity studies suggest that the LD50 for 2,4,5-T is 133.1 mg of 2,4,5-T per kg of egg weight. The LD50 for TCDD was estimated to be 0.24 μg of TCDD per kg of egg weight. A partitioned chi-square analysis of the embryo viability data and the nonparallel dose response lines obtained from 2,4,5-T and TCDD suggest an independent mode of action for the two chemicals. As a result of the injection of these two chemicals, increased liver weight to egg weight percentages occurred. Liver weight enlargement as a result of elevated nucleic acid content was ruled out based on the following observations: (1) both RNA and DNA levels per gram of liver tissue were depressed and (2) treatment group RNA to DNA ratios remained the same as controls. (Author abstract by permission)

78-0836. Mitchell, A. I. ; Plack, P. A.; Thomson, I. M. (Nat. Environ. Res. Counc., Inst. Mar. Biochem., St. Fittick's Road, Aberdeen AB1 3RA, Scotland) **Relative concentrations of ^{14}C-DDT and two polychlorinated biphenyls in the lipids of cod tissues after a single oral dose.** *Arch. Environ. Contam. Toxicol.* 6(4): 525-532; 1977. (13 references)

From 2 hr to 14 days after a single oral dose of 5 μCi (55 μg) of ^{14}C-DDT, tissues of cod (*Gadus morhua*) were analysed for ^{14}C, total lipid, triglyceride, phospholipid, and total cholesterol. The absolute concentrations of DDT on a total lipid basis varied from fish to fish and from tissue to tissue, but the values for liver were highest for most of the fish. When the relative concentrations (defined as concentration of DDT in tissue X 100/concentration of DDT in liver of the same fish) were calculated for each fish, from values of μg DDT/g total lipid, similar values were obtained for the same tissues of different fish killed from 1 to 14 days after the dose, indicating a rapid achievement of the equilibrium state. These relative concentrations on the basis of μg DDT/g total lipid varied from tissue to tissue over a range of 17-fold. Relative concentrations were also calculated from values of μg DDT/g wet weight of tissue, μg DDT/g triglyceride, μg DDT/g phospholipid, and μg DDT/g total cholesterol. On a triglyceride basis, the range was reduced to 7-fold, with four of the tissues not significantly different, but on the basis of wet weight, phospholipid, and cholesterol the values of relative concentration had a range much wider than 17-fold. It would appear that the triglycerides play an important role in the distribution of DDT in cod tissues but are not the only class of lipid affecting the distribution. Two PCBs were distributed in a similar, although not identical, manner. (Author abstract by permission)

78-0837. Greim, H. ; Bimboes, D.; Egert, G.; Goeggelmann, W.; Kraemer, M. (Dep. Org. Chem., Univ. Tubingen, D-7400 Tubingen, Germany) **Mutagenicity and chromosomal aberrations as an analytical tool for in vitro detection of mammalian enzyme-mediated formation of reactive metabolites.** *Arch. Toxicol.* 39(1/2): 159-169; 1977. (60 references)

Incubation of trichloroethylene, 1,1-dichloroethylene, vinylchloride, tetra-chlorocyclopentadiene, the nitroso derivatives of the pesticides carbaryl, prometryn, and dodin in the presence of metabolically active mouse liver microsomes and bacteria as target cells were mutagenic, whereas tetrachloroethylene, 1,2 *cis*- and *trans*-dichloroethylene, hexachlorocyclopentadiene, carbon tetrachloride, chloroform, halothane, trichlorofluoromethane and styrene were not activated to mutagenic species. In a similar in vitro test system using freshly isolated human lymphotes as target cells dimethylnitrosamine induced chromosomal aberrations. It is concluded from the experiments that submammalian or mammalian in vitro cell systems with metabolically active liver microsomes are not only suitable to screen for chemical mutagens but to demonstrate formation of reactive intermediates, which are short lived and cannot be detected by chemical procedures. (Author abstract by permission)

78-0838. Torracca, A. M. ; Cardamone, G. C.; Ortali, V.; Carere, A.; Raschetti, R.; Ricciardi, G. (Author address not

given) **Mutagenicita di pesticidi come prodotti puri e dopo attivazione metabolica con microsomi di fegato di ratto. [Mutagenicity of pesticides as pure compounds and after metabolic activation with rat liver microsomes.]** *Atti Assoc. Genet. Ital.* 21: 28-29; 1976. (Italian)

Two genetic systems were used to investigate mutagenic activity of aminotriazole, benomyl, captan, dichlorvos, ioxynil, and picloram. The pesticides were tested with four *Salmonella typhimurium* strains which require histidine, TA1535, TA1536, TA1537, and TA1538, for induction of revertants. The *in vitro* microbial assay used liver tissue homogenates from male rats. Sodium phenobarbital was used to induce liver microsomal enzymes. Benomyl induced revertants in TA1536, TA1537, and TA1538 without metabolic activation. Captan was mutagenic only in TA1535. Except for dichlorvos, whose mutagenic activity in TA1535 is doubtful, the other pesticides showed no mutagenic activity in *Salmonella typhimurium*. The pesticides were also investigated with regard to induction of resistance to streptomycin in the bacterium *Streptomyces coelicolor*. Aminotriazole, dichlorvos, and picloram induced streptomycin resistance when microsomal fractions were absent.

78-0839. Seawright, A. A. ; Costigan, P. (Vet. Sch., Univ. Queensland, St. Lucia, Queensland, 4067, Australia) **Some toxicity aspects of dichlorvos flea collars in cats.** *Aust. Vet. J.* 53(11): 215-218; 1975. (18 references)

In this study of the toxicity aspect of the use of dichlorvos flea collars in cats, whole blood cholinesterase determinations were made as a means of assessing the duration of effect on the animals of exposure to dichlorvos through application of the flea collar. The flea collar contained 500 mg of the insecticide. No overt signs of toxicity occurred. Weight gain was not significantly affected. Whole blood cholinesterase was reduced within the first week of application of the collar and remained below pretreatment levels for 5 to 8 weeks before returning to normal presumably as the insecticide concentration in the resin was progressively reduced. Signs of systemic organophosphate toxicity did occur within 1 week of the application of three collars to each of two cats kept in the same cage. This suggested that the likelihood of toxicity occurring in cats after the use of dichlorvos flea collars depends mainly on the degree of exposure to the insecticide. Under most conditions of keeping domestic cats in Australia, the use of a single dichlorvos flea collar should therefore be without any untoward effect although some initial and transient inhibition of whole blood and nervous tissue cholinesterases would be expected.

78-0840. Lindstrom, T. D.; Anders, M. W. (Dep. Pharmacol., Univ. Minnesota, Minneapolis, MN 55455) **Effect of agents known to alter carbon tetrachloride hepatotoxicity and cytochrome P-450 levels on carbon tetrachloride-stimulated lipid peroxidation and ethane expiration in the intact rat.** *Biochem. Pharmacol.* 27(4): 563-567; 1978. (27 references)

Administration of carbon tetrachloride (CCl_4) to rats led to an increase in expired ethane by 15 min. Prior treatment of rats with phenobarbital led to a significant increase in both CCl_4-stimulated ethane expiration and hepatic microsomal lipid diene conjugation, while prior treatment with 3-methylcholanthrene or CCl_4 led to a decrease in both parameters. Treatment with isopropanol increased CCl_4-stimulated ethane expiration, while neither ethanol nor diethyl maleate treatment altered the response to CCl_4. Cobaltous chloride treatment significantly decreased CCl_4-stimulated ethane expiration. A strong correlation was found between CCl_4-stimulated hepatic microsomal lipid diene conjugation and ethane expiration. (Author abstract by permission)

78-0841. Beatty, P. ; Neal, R. A. (Cent. Environ. Toxicol, Dep. Biochem., Vanderbilt Univ., Sch. Med., Nashville, TN 37232) **Factors affecting the induction of DT-diaphorase by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Biochem. Pharmacol.* 27(4): 505-510; 1978. (31 references)

The compound 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), a toxic contaminant in some preparations of chlorinated phenols, is a potent inducer of a number of enzymes including rat liver DT-diaphorase (EC 1.6.99.2). The present study has shown that the induction of DT-diaphorase by TCDD is prevented by prior administration of actinomycin-D. In addition, it has been shown that administration of TCDD brings about an increase in NADPH-diaphorase activity in a number of extrahepatic tissues of the rat. In contrast to the rat, the adult male guinea pig, the species most sensitive to the toxic effects of TCDD, exhibits little or no increase in DT-diaphorase activity in various tissues in response to TCDD administration. The compound 1,2,3,4,6,7,-8,9-octachlorodibenzo-*p*-dioxin (OCDD) is much less toxic than TCDD. OCDD was also shown to be much less potent as an inducer of rat liver DT-diaphorase than TCDD. (Author abstract by permission)

78-0842. Rand, G. M. (Dep. Biol., Texas A&M Univ., College Station, TX 77843) **The effect of exposure to a subacute concentration of parathion on the general locomotor behavior of the goldfish.** *Bull. Environ. Contam. Toxicol.* 18(2): 259-266; 1977. (20 references)

Goldfish were placed in water containing 0.33 ppm parathion for 24 hr. For 8 hr before and after the parathion exposure the behavior of each goldfish was monitored in a tank containing 16 compartments. In the 8 hr before treatment, the number of times the fish entered a compartment ranged from 447 to 1651. Comparable figures for the 8 hr after treatment were 369 to 1382. In six of the nine fish, the average duration of pathways increased after treatment, but the average increase was not significant. As the fish left a compartment, the orientation angle was recorded. Turning left was designated as -180° and turning right was designated as +180°. Before treatment the most common orientation angles were relatively small, 45° or 67° in each direction. After treatment, orientation angles of 90° or more in each direction became most common in some fish. Thus parathion exposure alters locomotor behavior.

78-0843. McCorkle, F. M. ; Chambers, J. E.; Yarbrough, J. D. (Dep. Zool., Mississippi State Univ., Mississippi State, MS 39762) **Acute toxicities of selected herbicides to fingerling channel catfish, *Ictalurus punctatus*.** *Bull. Environ. Contam. Toxicol.* 18(3): 267-270; 1977. (7 references)

One-year-old channel catfish were placed in aquaria containing 1 or 10 ppm of alanap, bensulide, chloramben, 2,4-D acid, 2,4-D dimethyl amine salt, dalapon, diuron, DNBP, DSMA, EPTC, fluometuron, metribuzin, monuron, MSMA, nitralin, propanil, 2,4,5-T, trifluralin, the herbicide mixture Dyanap, or the insecticide endrin for 48 hr. Only propanil, trifluralin, bensulfide, DNBP, and endrin caused more than 10% mortality. Their 96-hr LC50 values were calculated at 3796 ppb for propanil, 417 ppb for trifluralin, 379 ppb for bensulfide, 118 ppb for DNBP, and 0.8 ppb for endrin. Since it is improbable that herbicide concentrations in commercial catfish ponds will exceed 10 ppm, the other 14 herbicides are unlikely to cause acute harm to catfish when used around the ponds. Since Dyanap, a mixture of DNBP and alanap, was less toxic than DNBP, no synergism was indicated.

78-0844. Rehwoldt, R. E. ; Kelley, E.; Mahoney, M. (Environ. Sci. Program, Marist Coll., Poughkeepsie, NY) **Investigations into the acute toxicity and some chronic effects of selected herbicides and pesticides on several fresh water fish species.** *Bull. Environ. Contam. Toxicol.* 18(3): 361-365; 1977. (7 references)

The chronic exposure of striped bass, carp, guppy, banded killyfish, pumpkinseed, white perch and the American eel to 2,4-D or 2,4,5-T did not produce observable physiological symptoms, nor was there any raising of the toxic level in these fish. Under the toxicity studies, TLm values were not significantly different after exposure to sub-lethal amounts of these reagents. No differences in weight/time relations were noted between the exposed and the control fish. Chronic exposure to the organophosphorus compounds resulted in substantial reductions of brain acetylcholinesterase levels.

78-0845. David, D. (Lab. Biol. Anim., Univ. Clermont-Ferrand, 63170 Aubiere, France) **Detection du DDT dans l'oeuf de Caille. Analyse quantitative. [Detection of DDT in quail eggs. Quantitative analysis.]** *C. R. Acad. Sci. Ser. D.* 285(15): 1347-1350; 1977. (4 references) (French)

Quail eggs immersed for 30 sec in a 0.5% aqueous suspension of commercial DDT (active agent content 48%; 35% *p,p'*-DDT, 11% *o,p'*-DDT and 2% *p,p'*-DDE) or in a hexane solution of DDT, untreated eggs, and commercial feed fed to the quails were analyzed for DDT and its metabolites. A gas-chromatographic method was employed, using an electron capture detector and aldrin as internal standard after partitioning between acetonitrile and hexane. The feed contained 0.073 pg of total DDT (0.007 mg of *p,p'*-DDE, 0.022 mg of *o,p'*-DDT and 0.044 mg of *p,p'*-DDT). Untreated eggs contained 30 ng of *p,p'*-DDE, 5 ng of *o,p'*-DDT and 70 ng of *p,p'*-DDT. Residue levels found in eggs treated with an aqueous suspension and stored in an incubator for 1-4 days were 72 ng of *p,p'*-DDE, 220 ng of *o,p'*-DDT and 380 ng of *p,p'*-DDT. The corresponding residue levels were 1,691 ng, 6,696 ng and 31,795 ng after immersion in a hexane solution of DDT. The eggshells treated with aqueous suspension contained 534 ng of *p,p'*-DDE, 619 ng of *o,p'*-DDT and 6,078 ng of *p,p'*-DDT. The findings indicate that part of the *p,p'*-DDT is metabolized to *p,p'*-DDE within the first hours of incubation, and that *o,p'*-DDT penetrates into the eggs more easily than does *p,p'*-DDT.

78-0846. Ramade, F. ; Roffi, J. (Lab. Zool., Univ. Paris-Sud, 91405 Orsay, France) **Action de deux insecticides, le Lindane et le DDVP (Dichlorvos) sur les surrenales de la Souris. [Action of two insecticides, lindane and DDVP (dichlorvos), on the adrenal glands of mice.]** *C. R. Acad. Sci. Ser. D.* 282(10): 1067-1070; 1976. (11 references) (French)

Nonpregnant female OFI mice received ip or sc injections of lindane or DDVP (dichlorvos), and were sacrificed a few hours to 2 months later to determine the effects of these pesticides on the adrenal glands. Lindane and DDVP were administered in sublethal doses (0.5-1.9 mg). Neither lindane nor DDVP caused the death of any of the animals. Mice treated with 1.9 mg of lindane ip showed 18.6% increase of the adrenal weight compared with the untreated control ($P < 0.001$). The increase in the weight and volume of the adrenal glands, observed 3 days after injection, was due to hypertrophy of the adrenal cortex, but there was no notable change in the volume of the medulla. The quantity of epinephrine and norepinephrine relative to unit weight of the adrenals was reduced. The ascorbic acid level of the adrenals and the hepatic monoamine oxidase activity showed no significant change on the same date. Mortality rates of 0%, 7%, 81% and 86% were observed in mice treated with respective doses of 0.3, 0.75, 1.125 and 1.5 mg of DDVP ip. The lowest dose caused no change in the adrenal weight, but doses of 0.75 and 1.125 mg caused 21% and 43% increases, respectively, in the adrenal weight 10 days after administration. DDVP also caused depletion of the epinephrine and norepinephrine content of the adrenals; even the lowest dose (0.3 mg) caused a significant reduction ($P < 0.05$). DDVP did not modify the ascorbic acid level in the adrenals. The increase in adrenal weights appears to be due to stimulation of the adrenals by the pituitary gland as a consequence of the neurotropic action of these pesticides.

78-0847. David, D. (Lab. Biol. Anim., Univ. Clermont, 63170 Aubiere, France) **Effets compares d'injections intravitellines de *p,p'*-DDT et de DDT commercial sur la population germinale des gonades embryonnaires d'Oiseau. [Comparison of the effects of *p,p'*-DDT and commercial DDT, injected into the vitellus, on the germ cell population in the gonads of bird embryos.]** *C. R. Acad. Sci. Ser. D.* 282(11): 1125-1128; 1976. (4 references) (French)

The effects of commercial DDT and *p,p'*-DDT on the germ cell populations and development of Hubbard chick and quail embryos were studied. The eggs were immersed in a 0.5% suspension of commercial DDT or *p,p'*-DDT, or the

substances, dissolved in olive oil, were introduced into the vitellus. The quantities introduced were 2.5 or 5 mg of *p,p'* -DDT and/or 10 mg of commercial DDT (with 50% active agent). The eggs were examined after 5-6-days of incubation in stage 29. The lethal effect produced by injected DDT was more pronounced than the effect observed after immersion. Commercial DDT introduced into the vitellus of quail eggs caused hemorrhages of the embryos and developmental anomalies, e.g., coelosomy, microphthalmia and exencephaly. The size of the embryos was also smaller than in the controls. In the gonads of quail embryos, the reduction of the germ cell population was about the same after immersion and injection. Less marked reduction was seen in chick embryos especially after intravitelline administration. The lethal effect of *p,p'*-DDT injection into the vitellus was less marked than that of commercial DDT, but the 5 mg dose caused developmental malformations in 41%. The *p,p'*-DDT also reduced the germ cell population. The findings indicate that *p,p'*-DDT is responsible for the reduction of the germ cell populations in embryos treated with commercial DDT.

78-0848. Lulham, G. ; Ashtakala, S. S.; Lenoir, J. A. (Dep. Biol. Sci., Sir George Williams Campus, Concordia Univ., Montreal, P.Q. H3H 1M8, Canada) **Metabolism and translocation of 3-amino- 1,2,4-triazole in *Pinus pinea*.** *Can. J. Bot.* 55: 2296-2305; 1977. (13 references)

Seedlings of *Pinus pinea*, a Mediterranean conifer, were treated with 0.25 μCi of labeled amitrole. The amitrole was painted onto an epidermis-stripped surface of the phloem or injected into the xylem of the hypocotyl below the cotyledons, 1.5 cm from the tip of a cotyledon, into the xylem core of the root, or into the phloem tissue of the hypocotyl. Thin layer chromatography detected three metabolites in addition to amitrole. Fifteen days after treatment, some of the metabolites were present at higher concentrations than amitrole. Since metabolites were found in both the treated hypocotyl and the treated cotyledon, it is apparent that the hypocotyl and the cotyledon can metabolize amitrole and the metabolites can move within the plant.

78-0849. Forsberg, C. W. (Dep. Microbiol., Univ. Guelph, Guelph, Ontario, Canada) **Some effects of arsenic on the rumen microflora; an in vitro study.** *Can. J. Microbiol.* 24(1): 36-44; 1978. (29 references)

The rate of fermentation of the rumen microflora was inhibited almost 30% by 5 μg/ml of arsenic added in the form of arsenite, although 304 μg/ml was required to cause 50% inhibition. Arsenate was less inhibitory. The rate of fermentation of a separated bacterial fraction was inhibited 37% by 1 μg/ml of arsenite whereas 100 μ,had little effect on the fermentation of a separated protozoal fraction. Similar results were obtained for arsenate. Both fractions had the capacity to take up arsenate, but the protozoa took it up more readily to a higher intracellular concentration. Both arsenate and arsenite inhibited the growth of a number of rumen bacteria in pure culture at concentrations as low as 5 μg arsenic/ml. The greater resistance of *Megasphaera elsdenii* to arsenate as compared with that of *Bacteroides succinogenes* was not related to the inability to take up the element. In conclusion, the concentrations of arsenic causing a significant inhibitory effect on the fermentative activity and growth of some rumen bacteria are less than that reported to be toxic to ruminant animals. (Author abstract by permission)

78-0850. Christensen, G. M. ; Tucker, J. H. (Natl. Water Qual. Lab., Duluth, MN 55804) **Effects of selected water toxicants on the *in vitro* activity of fish carbonic anhydrase.** *Chem. Biol. Interact.* 13: 181-182; 1976. (50 references)

The effects of various concentrations of phenylmercuric acetate, carbaryl, diazinon, lindane, DDT, and 51 other substances on the activity of carbonic anhydrase (CA) from red blood cells of channel catfish were studied. The specific activity of CA was determined using a series of chemical reactions beginning with the slowest reaction, that of CO_2 with H_2O. The rates of reaction of the enzyme preparation in buffer and all of the components except the enzyme were determined for each inhibitor and the percent inhibition was calculated from reference to them. Lindane was only slightly inhibitory at 0.1 m*M* but caused about 28% inhibition at 1 m*M*. Phenylmercuric acetate caused almost no inhibition at 1 μ*M*, about 10% inhibiton at 10 μ*M*, about 72% at 100 μ*M*, and slightly over 90% at 1 m*M*. Diazinon caused almost no inhibition at 10 μ*M* and about 60% inhibition at 100 m*M*. DDT caused almost no inhibition at 100 μ*M* and about 63% inhibition between 1 m*M* and 10 m*M*. Carbaryl also caused almost no inhibition at 0.1 m*M* and only about 30% at 10 m*M*. The most inhibitory pesticide was phenylmercuric acetate, which caused 50% inhibition at 65 μ*M*. Diazinon and DDT caused 50% inhibition at 1.0 m*M* and 4.0 m*M*, respectively. Concentrations causing 50% inhibition for lindane and carbaryl were estimated at 4.5 m*M* and 0.3 *M*, respectively.

78-0851. Ernst, W. (Inst. Meeresforsch., D-2850 Bremerhaven, Germany) **Determination of the bioconcentration potential of marine organisms; a steady state approach. I. Bioconcentration data for seven chlorinated pesticides in mussels (*Mytilus edulis*) and their relation to solubility data.** *Chemosphere* 6(11): 731-740; 1977. (20 references)

Mussels were placed in aquaria filled with sea water containing up to about 2 ppb ^{14}C-γ-HCH (lindane) or a mixture of pesticides. In some experiments these levels were kept constant; in others the concentration was allowed to change until it reached a constant value. After the constant value was reached, the aquarium water was circulated through an activated charcoal filter to remove the pesticides, so that the rate of pesticide loss from the mussels in untreated water could be determined. The equilibrium concentrations were reached at about 50 hr after the mussels were placed in the water containing the pesticides. γ-HCH declined from an initial concentration of 1.917 ppb to an equilibrium concentration of 0.935 ppb; dieldrin, from 1.97 ppb to 0.17 ppb, and DDD (TDE) from 2.18 ppb to 0.05 ppb. γ-HCH had a concentration factor, calculated as the ratio of concentration in

mussels to concentration in water at steady state, of 134. Concentration factors for the other pesticides were 106 for α-HCH, 1700 for heptachlor epoxide, 600 for α-endosulfan, 1570 for dieldrin, 1920 for endrin, and 9120 for DDD. The concentration of ^{14}C-γ-HCH in mussels was 14.8 ppb when the concentration in water remained at 0.087 ppb and 118.0 when the concentration in water remained at 0.909 ppb. Half lives for pesticide loss in pure sea water were 19.2 hr for α-HCH, 22.1 hr for γ-HCH, 48.8 hr for heptachlor epoxide, 33.8 hr for α-endosulfan, 53.1 hr for dieldrin, 41.8 hr for endrin, and 119 hr for DDD. When only ^{14}C- HCH was used, the highest concentrations occurred in the foot and digestive gland. Concentration factors correlated well with solubility.

78-0852. Korte, F. ; Freitag, D.; Geyer, H.; Klein, W.; Kraus, A. G.; Lahaniatis, E. (Inst. Chem. Tech., Univ. Muenchen, D-8050 Freising Weihenstephan, Germany) **A concept for establishing ecotoxicologic priority lists for chemicals.** *Chemosphere* 7(1): 79-102; 1978. (45 references)

The environmental behavior of aldrin, pentachloronitrobenzene, *p*-chloroaniline, monolinuron, 2,4,6-trichlorophenol, pentachlorophenol, metribuzin, 2,6-dichlorobenzamide, and hexachlorobenzene was investigated. Male rats were given 1 mg pesticide for each kg of food in three daily doses using a stomach tube. Total elimination in urine ranged from 0.4% of the dose for hexachlorobenzene to 82.3% for 2,4,6-trichlorophenol. Total elimination in the feces ranged from 17.2% for monolinuron to 89.8% for pentachloronitrobenzene. The largest residue was 1.89% of the dose/g tissue for hexachlorobenzene in fatty tissue. Residues were not detected for pentachloronitrobenzene, *p*-chloraniline, or 2,4,6-trichlorophenol. Golden orfes were placed in water containing 50 μ/g pesticide/l. The ratio of chemical concentration in fish to chemical concentration in water ranged from less than 20 for *p*-chloraniline, monolinuron, metribuzin, and 2,6-dichlorobenzamide to 3700 for aldrin. The logarithm of this ratio decreased linearly with increasing solubility of the pesticides in water. In the activated sludge test, 50 micrograms/l of the pesticide were incubated in an activated sludge suspension. The ratio of pesticide concentration in sludge to pesticide concentration in water after 5 days ranged from 30 for metribuzin and 2,6-dichlorobenzamide to 23,000 for hexachlorobenzene. In the refuse composting test, the percentage of pesticide metabolites in the extract ranged from 11.6% for aldrin after 21 days of composting to 76.6% for pentachloronitrobenzene after 28 days of composting. Cotton wadding moistened with water containing about 10 μ/g of C^{14} labeled pesticide per g of damp wadding was burned. The percentage of $^{14}CO_2$ recovered ranged from 98% for *p*-chloroaniline to 76% for aldrin. The percentage of ^{14}C in soot was highest, 12%, when aldrin and pentachlorophenol were incinerated in polycarbonate capsules, and it was below the detection limits when *p*-chloraniline, monolinuron, 2,4,6-trichlorophenol, or pentachlorophenol was incinerated in a cellulose capsule. Pesticides were irradiated by a mercury high pressure lamp while in a rotating drum. The percentage of the initial quantity of pesticide not changed ranged from 12% for pentachlorophenol adsorbed on silica gel to 99% for hexachlorobenzene. No solid transformation products were detected for the former; 81 mg solid phase aldrin produced 37 mg solid transformation proudcts, 6 days irradiation, and 99.3 mg aldrin adsorbed on silica gel produced 166.8 g solid transformation products after 0.6 days irradiation.

78-0853. Luster, M. I. ; Albro, P. W.; Faith, R. E.; Lawson, D. D. (Environ. Biol. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Inability of passive antibodies to reverse the effects of dioxin toxicity.** *Chemosphere* 7(1): 29-34; 1978. (20 references)

Nine-wk-old male C57Bl/6J-fh mice were given 250 μg/kg body weight of TCDD by gavage. Gamma globulin was obtained from rabbits immunized with TriCDD-NH_2 protein conjugate. The mice were then given 0.4 ml of either phosphate buffered saline (PBS), normal rabbit gamma globulin (NRG), or immune rabbit gamma globulin (IRG), administered im. A method involving precipitation of radioactively labeled antigen indicated that 1 ml of the IRG preparation was capable of binding 6.6 μg of TriCDD-NH_2. Each mouse receiving IRG received enough to bind approximately 44% of the TCDD. Tests of relative specificity showed that TCDD inhibited the reaction between labeled antigen and antibody at least as well as TriCDD-NH_2 and RSA conjugated TriCDD-NH_2. Controls receiving NRG without TCDD had a significantly higher body weight than mice from groups receiving TCDD, whose body weight did not differ significantly. For all groups of mice receiving TCDD cumulative mortality was very low until between 12 and 15 days. It then increased until 21 to 24 days, after which at leveled off at approximately 90% or more. Cumulative mortality for mice not receiving TCDD remained very low. Separate groups of mice were given IRG one day before and one day after TCDD; IRG was neither prophylactic nor therapeutic for TCDD poisoning in mice.

78-0854. Tillmanns, G. M. ; Wallnoefer, P. R.; Engelhardt, G.; Olie, K.; Hutzinger, G. (Abt. Pflanzenschutz, Bayerische Landesanst., Bodenkulter. Pflanzenbau, D-8000 Munchen 19, Germany.) **Oxidative dealkylation of five phenylurea herbicides by the fungus *Cunninghamella echinulata* Thaxter.** *Chemosphere* 7(1): 59-64; 1978. (12 references)

The herbicides linuron, monolinuron, diuron, monuron, buturon, and ureido-^{14}C-linuron were added to cultures of the fungus *Cunninghamella echinulata* Thaxter. A herbicide concentration of 0.1 m*M* was used for degradation studies, and a concentration of 0.5 m*M* was used to isolate the metabolites. Monuron, monolinuron, and buturon all produced 3-(4-chlorophenyl)- 1-methylurea and 3-(*p*-chlorophenyl) urea as metabolites. Monolinuron also produced 3-(4-chlorophenyl)- 1-methoxy-1- hydroxy methylurea and 3-(4-chlorophenyl)- 1-methoxyurea. Diuron and linuron were both metabolized to 3-(3,4-dichlorophenyl)- 1-methylurea and 3,4-dichlorophenylurea. Linuron was also metabolized to 3-(3,4-dichlorophenyl)- 1-methoxy- 1-

hydroxymethylurea and 3-(3,4-dichlorophenyl)- 1-methoxyurea. Buturon was metabolized to 3-(4-chlorophenyl)- 1-*i*-butinylurea and 3-(4-chlorophenyl)- 1-methyl-1-*i*-butenylurea. Fungus incubated with ureido-^{14}C-linuron grew rapidly until after 8 days, when growth leveled off at over 150 mg mycelium/30 ml culture medium. After 19 days it decreased to about 140 mg mycelium/30 ml culture medium. Ureido-^{14}C-linuron decreased rapidly until it reached a very low value after day 4. Formation of 3-(3,4-dichlorophenyl)- 1-methoxyurea was rapid until 4 days, when it accounted for between 40% and 50% of the radioactivity; it then decreased until it accounted for less than 5% of the radioactivity at day 26. Formation of 3-(3,4-dichlorophenyl)- 1-methoxy-1- hydroxymethylurea was very rapid between days 1 and 2, when it accounted for about 25% of the radioactivity. Betweendays 3 and 5 it decreased, until it accounted for approximately 10% of the radioactivity, where it remained constant. Formation of 3-(3,4-dichlorophenyl)- 1-methylurea increased between days 3 and 4 until it accounted for approximately 5% of the radioactivity; this level remained constant. Monolinuron, monuron, and diuron were degraded at similar rates via the known *N*-dealkylation routes. Growth of fungus with synthetic derivatives indicated that 3-(4-chlorophenyl)- 1-methylurea further degraded to 3-(*p*-chlorophenyl) urea, and 3-(3,4-dichlorophenyl)- 1-methylurea and 3-(3,4-dichlorophenyl)-1-methoxyurea further degraded to 3,4-dichlorophenyl urea.

78-0855. Haque, A. ; Scheunert, I.; Korte, F. (Biol. Bundesanst., Inst. Pestic. Res., D-1000 Berlin 33 (Dahlem), Germany) **Isolation and identification of a metabolite of pentachlorphenol-^{14}C in rice plants.** *Chemosphere* 7(1): 65-69; 1978. (25 references)

Pentachlorophenol-^{14}C combined with inactive pentachlorophenol was applied to soil in three pots at an application rate equivalent to about 22 kg/ha. Fifteen 4-wk-old rice plants were grown in each pot for 1 wk. The plants adsorbed about 3% of the applied radioactivity, about half of which was bound to the plant material. Of the extracted portion, 90% was the parent compound, and 9% was unidentified conjugates. Thin layer chromatography, gas liquid chromatography, and mass spectrometry indicated that 1% was a metabolite identical with 2,3,4,6-tetrachlorophenol. It is possible that 2,3,5,6-tetrachlorophenol was also present. Analysis of the pentachlorophenol before application indicated that the tetrachlorophenol metabolite was not originally present. It is not known whether the metabolite was formed in the soil or in the plants.

78-0856. Viswanathan, R. ; Klein, W.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch. mbH Muenchen, D-8042 Neuherberg, Germany) **Separation and identification of metabolites excreted by rats after long term oral administration of Imugan-^{14}C.** *Chemosphere* 7(1): 71-78; 1978. (7 references)

Rats were given an oral dose of 50.9 μg Imugan-^{14}C daily for 20 days. Methyl-*N*(3,4-dichlorophenyl) carbamate, 3,4-dichloro aminophenol, 6-hydroxy-3,4- dichloroacetanilide (6-OH-3,4-DCAA), 3,4-dichloroacetanilide (3,4-DCAA), 3,4-dichloroformanilide (3,4-DCFA), three unidentified compounds containing two chlorine atoms each, 3,4-dichloroaniline (3,4-DCA), 3,4-dichloroisocyanate, and 6-methoxy- 3,4-dichloraniline (6-methoxy-3,4-DCA) were found in the urine of the rats. All except 3,4-dichloro aminophenol and one of the unidentified compounds were also found in the feces, as was 6 methoxy-3,4- dichloroacetanilide (6-OCH_3-3,4-DCAA). A major portion of the less polar fractions was excreted in the urine, and a large portion of the polar components was excreted in the feces. Nearly 10% of the total excreted radioactivity was in the form of 3,4-DCA, the major identifiable degradation product. In the metabolic pathway proposed, Imugan degrades initially into a major metabolite, 3,4-DCA, and a minor product, methyl-N(3,4-dichlorophenyl)carbamate. Further metabolism of 3,4-DCA produces 3,4-DCAA, 3,4-DCFA, and 3,4-dichloroaminophenol. Further metabolism of 3,4-dichloroaminophenol or 3,4-DCAA produces 6-OH-3,4-DCAA. Methylation of 3,4-dichloroaminophenol produces 6-methoxy-3,4-DCA. Further metabolism of 6-methoxy-3,4-DCA or 6-OH-3,4-DCAA produces 6-OCH_3-3,4-DCAA.

78-0857. Sheridan, P. F. (Virginia Inst. Mar. Sci., Gloucester Point, VA 23062) **Uptake, metabolism, and distribution of DDT in organs of the blue crab, *Callinectes sapidus*.** *Chesapeake Sci.* 16(1): 20-26; 1975. (42 references)

Blue crabs were placed in water containing 0.01, 0.1, and 1.0 ppm DDT for 12 hr. DDT levels in the gills decreased from 71, 972, and 808 ppb in crabs exposed to 0.01 ppm, 0.1 ppm, and 1.0 ppm after 12 hr to undetectable, 20 ppb, and 104 ppb, respectively, after 240 hr. DDT residues in the heart were 88 ppb after 12 hr at 0.1 ppm DDT, 382 ppb after 12 hr at 1.0 ppm DDT, and undetectable elsewhere. Maximum DDT concentrations in the hepatopancreas were 112 ppb after 96 hr in crabs exposed to 0.01 ppm DDT, 833 ppb after 96 hr in crabs exposed to 0.1 ppm DDT, and 604 ppb after 240 hr in crabs exposed to 1.0 ppm DDT. DDT was undetectable in the gonads of crabs exposed to 0.01 ppm DDT, decreased from 60 ppb after 12 hr in crabs exposed to 0.1 ppb, and accumulated, reaching 387 ppb at 240 hr, in the gonads of crabs exposed to 1.0 ppm DDT. DDT was not detected in the claw or backfin muscle of crabs exposed to 0.01 ppm DDT. It decreased after 12 hr from 127 ppb in the claw muscle of crabs exposed to 1.0 ppm DDT. Maximum DDD (TDE) levels in the hepatopancreas were 112 ppb after 96 hr in crabs exposed to 0.01 ppm DDT, 833 ppb after 96 hr in crabs exposed to 0.1 ppm DDT, and 604 ppb after 240 hr in crabs exposed to 1.0 ppm DDT. The continued rise after initial DDT exposure indicates that the site of DDT metabolism is the hepatopancreas. DDD residues in the gills were highest at 12 hr. DDD residues in the gonads varied widely. DDD was also detected in the backfin muscle, but not in the heart or the claw muscle. Maximum DDE concentrations in the gills, 12, 73, and 143 ppb, were detected after 12 hr in crabs exposed to 0.01, 0.1, and 1.0 ppm DDT, respectively. In the backfin muscle, DDE accumulated to 9, 23, and 30

ppb in crabs exposed to 0.01, 0.1, and 1.0 ppm DDT, respectively. The hepatopancreas and heart showed immediate high levels of DDE. DDE accumulated more slowly in the gonads and the claw muscle.

78-0858. Moscioni, A. D. (Univ. California, Berkeley, CA) **Organophosphate and methylcarbamate induced teratogenesis: mechanism of action in the chicken embryo.** *Diss. Abstr. Int. B* 38(8): 3514; 1978.

At least two patterns of developmental anomalies are discernible in chicken embryos following treatment with certain organophosphorus (OP) and methylcarbamate (MC) insecticides. One pattern (referred to as Type I), involving micromelia and retarded feather development, is associated with diminished embryo NAD levels and can be alleviated upon restoring the NAD levels by administration of nicotinamide or other NAD precursors. The second pattern of anomalies (Type II), expressed primarily as joint fusion defects, lacks association with lowered embryo NAD levels but may be caused by disruption of normal cholinergic function in the early embryo. Studies with 7 OP compounds and 1 MC compound confirm that Type I teratogenesis is manifested when embryo NAD levels (measured at day 12 of incubation after teratogen injection at day 4 of incubation) are lowered more than 50%. The most potent avian teratogens inducing Type I anomalies are crotonamide phosphates, pyrimidyl phosphorothionates and the MC compound eserine. The crotonamide phosphates, *O,O*-diethyl pyrimidyl phosphorothionates and eserine can cause a combination of both Types I and II teratogenesis, whereas *O,O*-dimethyl pyrimidyl phosphorothionates and the MC compound carbaryl manifest only Type I anomalies even at the highest doses. Additional studies with mice, chickens and pregnant rats failed to establish any correlation between lowered NAD levels or prolonged kynurenine formamidase inhibition and OP chronic toxicity, OP delayed neurotoxicity and OP or MC mammalian teratogenesis. Therefore, teratological or other toxicological manifestations of kynurenine formamidase inhibition are probably restricted to species and developmental stages where reduced enzyme activity significantly impairs maintenance of normal levels of NAD or other essential biochemicals derived from kynurenine. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 77-31475)

78-0859. Beatty, P. W. (Vanderbilt Univ., Nashville, TN) **Studies of the metabolism and possible mechanisms of toxicity of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD).** *Diss. Abstr. Int. B* 38(8): 3665; 1978.

Several possible biochemical mechanisms of toxicity of TCDD have been investigated. A study of the effects of TCDD on cultured mammalian cells and on liver regeneration in rats after partial hepatectomy showed that TCDD is not an inhibitor of mitosis in mammalian cells. Studies of effects of TCDD on adrenal glucocorticoid hormone activity in the rat suggest that the toxicity of TCDD is not mediated by increased production of adrenal glucocorticoids, by binding of TCDD to the glucocorticoid receptor of hepatic cytosol or by hypersensitization of tissues to the actions of normal levels of glucocorticoids. Investigations of thyroid hormone activity in rats and the larval form of *Rana catesbeiana* indicated that TCDD does not interfere with the function of the thyroid hormones in these species. In addition, TCDD was found to have little or no toxicity for larval or adult forms of *R. catesbeiana*. The effect of TCDD intoxication on the ammonia levels in the serum of rats was studied; TCDD does not lead to an increased serum level of ammonia. Determination of the flavin coenzyme content of rat liver and a survey of the activity of various flavin enzymes in the rat indicate that TCDD does not inhibit the synthesis of FAD or FMN or the activity of FAD or FMN containing enzymes. In rats, activity DT-diaphorase [E.C. 1.6.99.2] is markedly enhanced by TCDD. However, it was concluded that induction of this enzyme does not play a role in TCDD intoxication, either through depletion of reduced pyridine nucleotides or production of superoxide anion. Results have shown in rats that TCDD intoxication does not lead to a decrease in the hepatic ATP content, nor cause direct impairment of hepatic mitochondrial respiration. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 77-30348)

78-0860. Pritchard, J. B. (Lab. Pharmacol., Mar. Pharmacol. Biomed. Sect., NIEHS, Research Triangle Park, NC 27709) **Competitive inhibition of organic acid transport in kidney and choroid plexus by DDA and 2,4-D.** *Environ. Health Perspect.* 20: 228; 1977.

Initial in vivo studies showed that urinary excretion of the polar DDT metabolites, DDA, was nearly 250 times as great as DDT excretion in the winter flounder. Using isolated flounder renal tubules as a test system, tissue-to-medium DDA ratios reached 15-20. Metabolic inhibitors and other organic acids prevented this accumulation. Autoradiography demonstrated that the bulk of this uptake was intracellular and that cyanide and organic acids reduced intracellular DDA. DDA competitively inhibited renal *p*-aminohippurate uptake. On the basis of these results it was predicted that DDA and chemically similar compounds such as 2,4-D should also inhibit organic acid transport at other sites, including the choroid plexus where acidic metabolites of serotonin are secreted from the cerebrospinal fluid into the blood for subsequent elimination elsewhere. DDA, organic acids, and 2,4-D inhibited rabbit choroid plexus transport of the serotonin metabolite, 5-hydroxy-3-indole acetic acid (HIAA). Related compounds which are not organic anions, such as DDT, were not inhibitory, nor was dieldrin. Kinetic techniques showed that DDA or 2,4-D competed with the transported anion, HIAA. Thus, DDA inhibits through its interaction with the organic acid carrier.

78-0861. Neufeld, G. ; Pritchard, J. (Lab. Pharmacol, Mar. Pharmacol. Biomed. Sect., NIEHS, Research Triangle Park, NC 27709) ***In vitro* studies of blue crab gill Na±, K± -ATPase and its response to DDT.** *Environ. Health Perspect.* 20: 228; 1977.

The Na^+, K^+-ATPase, or "sodium pump" of cell membranes is inhibited by several organochlorine compounds. The activity of Na^+, K^+-ATPase in homogenates of gill tissue from adult blue crabs was measured. Enzyme activity was higher in gill pairs numbers six and seven. When acclimated to full strength seawater, female crabs gills had nearly twice the enzyme activity of male crabs' gills, but enzyme activity in males increased 80% in 50% seawater. DDT concentrations as low as 1.0 ppm significantly inhibited the Na^+, K^+-ATPase in vitro. Near maximal inhibition was achieved at a DDT concentration of 9.0 ppm: further increases raised inhibition only slightly.

78-0862. Pohl, R. J. ; Fouts, J. R. (Toxic. Detoxic. Sect., Lab. Pharmacol., NIEHS, Research Triangle Park, NC 27709) **Xenobiotic metabolism in skin of hairless mice exposed to ultraviolet radiation, Aroclor 1260, or chlordane.** *Environ. Health Perspect.* 20: 230; 1977.

7-Ethoxycoumarin deethylase (7-EC) activity measured in chopped skin from the backs of female hairless mice was increased after exposure to ultraviolet radiation, but not after topical application of 2 mg Aroclor 1260. When mice were given chlordane or its persistent metabolite, oxychlordane, either ip or topically at doses which increase hepatic 7-EC activity, 7-EC activity was inhibited in skin pieces. Topical application of oxychlordane to skin did not affect 7-ethoxyresorufin deethylase (7-ERF) activity. When mouse skin was treated in vitro with chlordane or oxychlordane, 7-EC activity was inhibited.

78-0863. Ball, L. M. ; Chhabra, R. S. (Toxic. Detoxic. Sect., Lab. Pharmacol., NIEHS, Research Triangle Park, NC 27709) **Effects of environmental pollutants on the intestinal absorption of nutrients.** *Environ. Health Perspect.* 20: 231; 1977.

The effects of lead compounds and TCDD (dioxin) on the absorption of nutrients from rat small intestine were investigated using the in vitro everted sac and in situ tied-off intestinal loop techniques. The effect of lead exposure on the uptake of ^{14}C-glucose (Glu) and ^{14}C-leucine (Leu) depended on the form of lead and the age of the rats. When adult male rats were given 100 μg/kg TCDD po, Leu absorption was depressed, and Glu uptake was reduced in the first few hr, increased above control levels between 1 and 2 wk later, then declined again after 3 wk. Glucose uptake increased even more after 1 wk in untreated rats pair-fed to match the decreased food intake in treated rats. The adult rat intestine is relatively insensitive to lead, while TCDD has a more drastic influence on absorption, which may be secondary to its other deleterious metabolic effects.

78-0864. Matthews, H. B. ; Morales, N. M.; Kato, S.; McKinney, J. D.; Tuey, D. B. (Pharmacokinet. Sect., Lab. Pharmacol., NIEHS, Research Triangle Park, NC 27709) **Distribution and excretion of halogenated xenobiotics (PCB, PBB, and Kepone).** *Environ. Health Perspect.* 20: 233; 1977.

Kepone (dichlordecone), like PCB's and 2,4,5,2′,4′,5′-hexabromobiphenyl (PBB), was readily absorbed from the intestine, rapidly removed from the blood, and initially stored in the liver and muscle. Later, the less chlorinated PCBs were metabolized and excreted, while the highly chlorinated PCB's and PBB were translocated from the liver and muscle to the skin and adipose tissue. The effect of increasing chlorine content was greatest when the biphenyl molecule did not have two adjacent unsubstituted carbon atoms. Both PBB and Kepone are highly halogenated compounds, and neither has two adjacent unsubstituted carbon atoms. As would be predicted, they were not metabolized appreciably. In rats, Kepone was stored primarily in the liver and its rate of excretion in the bile was proportional to the liver concentration, with a half-life of approximately 18 days.

78-0865. Kitchin, K. T. ; Woods, J. S. (Lab. Environ. Toxicol., NIEHS, Research Triangle Park, NC 27709) **TCDD (dioxin) -induced alterations in microsomal hemoprotein-mediated enzyme activity in mammalian liver.** *Environ. Health Perspect.* 20: 243; 1977.

The effect of TCDD (dioxin) on hepatic microsomal hemoprotein-mediated enzyme activities was investigated. TCDD was administered po at dosages of 2 μg/kg to female rats. TCDD greatly elevated the activities of hepatic aryl hydrocarbon hydroxylase and ethoxyresorufin- *O*-deethylase, both cytochrome P-448 mediated enzymes. TCDD increased 4- and 2-hydroxylation of biphenyl 4- and 10-fold, respectively, and increased the hydroxylation of the novel substrate 4,4′-dimethylbiphenyl 24-fold. Hydroxylation of 4,4′-dimethylbiphenyl is apparently cytochrome P-448 dependent. Ethoxyresorufin- *O*-deethylase activity was induced 50-fold. The ethyl isocyanide 455 nm/433 nm absorption ratios were 0.50 and 1.13 in hepatic microsomes from control and TCDD-treated rats, respectively. Other investigations produced similar increases with 3-methylcholanthrene, a specific cytochrome P-448 inducer. TCDD induces the synthesis of cytochrome P-448, which mediates aryl hydrocarbon hydroxylase and ethoxyresorufin- *O*-deethylase in mammalian liver.

78-0866. Thigpen, J. E. ; McConnell, E. E.; Moore, J. A.; Faith, R. E. (Environ. Biol. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Effect of 2,3,7,8 -tetrachlorodibenzo- *p*-dioxin (TCDD) on host resistance to infectious agents.** *Environ. Health Perspect.* 20: 245; 1977.

Four-wk-old mice were dosed via gavage with TCDD 0.5, 1, 5, 10, or 20 μg/kg body weight weekly for 4 weeks, then infected with *Salmonella bern* or *Herpesvirus suis.* Another group of mice were given TCDD 5 μg/kg body weight on the same schedule and then induced with thioglycollate ip. TCDD (dioxin) doses of 1 μg or more significantly increased mortality from *Salmonella bern* infection and decreased the time from infection to death. TCDD did not significantly affect mortality in mice infected with *Herpesvirus suis.* TCDD-exposed mice had significantly fewer macrophages and lymphocytes. In in vitro studies, macro-

phages from TCDD-exposed mice phagocytized *S. bern* at a reduced rate at 1 hr, but the rate was unchanged at other times.

78-0867. McConnell, E. E. ; Moore, J. A.; Harris, M. W.; Haseman, J. K. (Environ. Biol. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Toxicity of chlorinated dibenzo-*p*-dioxins in mice, guinea pigs, and rhesus monkeys.** *Environ. Health Perspect.* 20: 245; 1977.

A single oral dose of various chlorinated dibenzo- *p* -dioxin (CDD) isomers was given to mice and guinea pigs and 2,3,7,8-TCDD was given to rhesus monkeys to establish and compare the LD50 and manifestations of toxicity. Additional chlorine atoms at an ortho position reduced toxicity somewhat, but not nearly to the degree caused by deletion of a chlorine atom at the 2, 3, 7, or 8 positions. Severely intoxicated animals showed marked weight loss. The average time to death at LD50 was 17-20 days for guinea pigs, 22-25 days for mice, and 42-47 days for monkeys. The lesions and organ weight effects were similar for all isomers within the same animal species. The size of the thymus was greatly reduced in all species due to a reduction in the number of cortical lymphocytes. Lesions included hepatic lesions in mice, hyperplasia of the transitional epithelium in the urinary tract of guinea pigs and monkeys, and epithelial lesions with involvement of the sebaceous glands and surrounding hair follicles in monkeys. Total serum protein was reduced in mice and monkeys.

78-0868. Faith, R. E. ; Luster, M. I. (Environ. Biol. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Modulation of immune function by chemicals of environmental concern.** *Environ. Health Perspect.* 20: 245; 1977.

The effects of TCDD (dioxin), lead, polybrominated biphenyls (PBB), and DES on the immune competence of experimental animals were studied. In TCDD exposed rats, cell-mediated immunity was suppressed as determined by in vitro response to T-cell mitogens and delayed hypersensitivity reactions, but humoral immune responses to bovine gamma globulin (BGG) were not suppressed. Rats exposed prenatally and postnatally to TCDD had depressed body weights and thymic weights. Increased in vitro mitogen responsiveness of peripheral blood lymphocytes indicated that cattle exposed to PBB in utero through contaminated feed had enhanced cell mediated immune function. Results with lead and DES also indicated that environmental chemicals can modulate various immune functions.

78-0869. Kaila, K. ; Saarikoski, J. (Dep. Physiol. Zool., Univ. Helsinki, 00100 Helsinki 10, Finland) **Toxicity of pentachlorophenol and 2,3,6-trichlorophenol to the crayfish (*Astacus fluviatilis* L).** *Environ. Pollut.* 12: 119-123; 1977. (16 references)

Crayfish were placed in aquaria containing various concentrations of penta chlorophenol (PCP) and 2,3,6-tri chlorophenol (TCP). Other crayfish were injected with various dosages of the substances. The pH of the aquaria containing the test compounds was adjusted to 6.5 or 7.5. Mortality followed a similar pattern with respect to concentration for all combinations of test compound and pH, although the concentrations at which a specific mortality percentage occurred were different. For TCP at pH 7.5 mortality was practically zero at 10 ppm, about 3% at about 12 ppm, about 93% at 25 ppm, and practically 100% at about 30 ppm. At pH 6.5 mortality was zero at 2 ppm TCP, about 27% at 4 ppm, and 100% by about 12 ppm. At the same pH mortality was practically zero at 4 ppm PCP, about 5% at 5 ppm, about 84% at about 12 ppm, and 100% at 20 ppm. At pH 7.5 mortality was practically zero at 30 ppm, about 13% at 40 ppm, about 90% at 60 ppm, and 100% at 100 ppm. The LC50 for PCP was 9.0 ppm at pH 6.5 and 53 ppm at pH 7.5. The LC50 for TCP was 5.4 ppm at pH 7.6 and 19 ppm at pH 7.5. PCP had a LD50 of 26 ppm and TCP a LD50 of about 38 ppm when injected in a solution at 1% of the weight of the crayfish. Injections of 10 ppm PCP killed none of the crayfish, and injections of 40 ppm PCP killed all of them. Injections of 30 ppm TCP killed none of the crayfish, and injections of 60 ppm TCP killed all of them.

78-0870. Courtney, W. A. M. ; Denton, G. R. W. (Dep. Zool., Westfield Coll., London Univ., London NW3 7ST, England) **Persistence of polychlorinated biphenyls in the hard-clam (*Mercenaria mercenaria*) and the effect upon the distribution of these pollutants in the estuarine environment.** *Environ. Pollut.* 10(1): 55-64; 1976. (23 references)

Hard-shell clams were exposed to Aroclor 1254 adsorbed onto alumina at concentrations of 1.25 and 12.5 ppb seawater for up to 21 days. Five hr after dosing any remaining PCB/alumina was filtered out of the seawater and each aquarium was redosed with fresh PCB-treated alumina. TLC was used to investigate the major DDT analogs from clams and separate them, except for *p,p'*-DDE, from PCB residues. Concentration factors for Aroclor ranged from 29 in the muscular foot of clams exposed to 12.5 ppb seawater for 3 days to 1794 in the visceral mass of clams exposed to 1.25 ppb seawater for 18 days. The ratio of concentration factors in the visceral mass and msucular foot ranged from 1.4 in clams exposed to 1.25 ppb seawater for 21 days to 5.3 in clams exposed to 1.25 ppb seawater for 12 days. Tissue extract from freshly collected clams showed a relative increase in the height of peak 8, indicating that *p,p'*-DDT had been present and had been converted to *p,p'*-DDE. The ratio of PCB to *p,p'*-DDE in these clams was about 10:1. The clams only accumulated half as much DDT as was previously determined for oysters. Both these clams and those exposed to 1.25 ppb Aroclor in the laboratory showed little change in PCB content after 3 mo in clean seawater as compared to previous results, indicating that *Mya arenaria* and *Crassostrea virginica* lost 50% to 90% of their DDT residues after 1 wk in clean seawater.

78-0871. Hoskins, B. B.; Hupp, E. W. (Dep. Life Sci., Worcester Polytech. Inst., Worcester, MA 01609) **Methyl-**

mercury effects in rat, hamster, and squirrel monkey; lethality, symptoms, brain mercury, and amino acids. *Environ. Res.* 15(1): 5-19; 1978. (46 references)

Methylmercury is a dangerous byproduct of fungicide application. Sprague Dawley rats, Syrian hamsters, and squirrel monkeys were given 1 mg to 12 mg methylmercury chloride ip. The percentage death rate in 24 hr for rats increased from about 10% at about 7 mg/kg to over 50% at about 10 mg/kg, and reached practically 100% at slightly less than 50 mg/kg. In hamsters, the death rate in 24 hr increased from less than 10% at 10 mg/kg to slightly less than 50% at about 15 mg/kg, increased slowly until about 30 mg/kg, then increased rapidly again. The death rate in 30 days for rats reached nearly 100% at about 20 mg/kg. The death rate in 30 days for hamsters did not become close to 100% until about 50 mg/kg. Monkeys developed severe neurological symptoms but were not killed within 24 hr by doses equivalent to those killing 90% of the rodents. Mercury concentrations in the cerebral hemisphere of rats ranged from 13.74 μg/g in rats with motor symptoms to 0.48 μg/g in rats receiving 1.0 mg methylmercury chloride and having no motor symptoms. The mercury concentration in the cerebral hemisphere of monkeys was 1.86 μg/g in a monkey given 2 mg methylmercury chloride and 6.76 μg/g in a monkey given 8 mg methylmercury chloride. Glutamate, glycine, aspartate, and GABA levels did not differ significantly among the three brain areas or between control and symptomatic rats. Glutamate content in the cerebral hemisphere was 1.54 μm/g in the control monkey but undetectable in two dosed monkeys. Aspartate content in the cerebral hemisphere was 2.70 μm/g in the control, but was not detected in two dosed monkeys. Glycine content in the cerebral hemisphere was 0.44 μg/g in the control, 1.05 μg/g in the monkey receiving 3 mg methylmercury chloride, and undetectable in two monkeys receiving higher doses. The γ-amino butyric acid content in the cerebral hemisphere was 1.0 μm/g in the control and as high as 4.6 μm/g in dosed monkeys.

78-0872. Sen'chuk, V. ; Adamska, T. (Author address not given.) **Vliyanie nekotorykh protivoiadiy na skorost' vsasyvaniya 2,4-dinitrofenola iz pishchevaritel'nogo trakta v krov. [The effect of some antidotes on the rate of 2,4-dinitrophenol utpake from the digestive tract into the blood.]** *Farmakol. Toksikol. (Moscow)* 40(4): 425-427; 1977. (7 references) (Russian)

The effects of ig administered antidotes (activated charcoal, tannin, magnesia, starch solution and paraffin oil) on the resorption of ig administered 2,4-dinitrophenol (5 mg suspended in water) were studied in albino Wistar rats. The 2,4-dinitrophenol concentrations in the blood were determined polarographically. The antidotes were administered 1 or 5 min after the administration of 2,4-dinitrophenol. The animals were deprived of food for 12 hr prior to the experiment. The 2,4-dinitrophenol concentration in the blood was highest after about 30 min both in the control group that received no antidotes, and in the groups treated with activated charcoal, tannin, starch solution, and magnesia, but the maximum was observed after 60 min in animals treated with paraffin oil. All antidotes reduced the resorption of 2,4-dinitrophenol into the blood; activated charcoal and magnesia were the most effective.

78-0873. Kuchin'skiy, M. ; Savitskiy, B.; Voronetskaya, G. (Dept. Histol. Embryol., Inst. Biostruct., Bialystok Med. Inst., Bialystok, Poland) **Morfologicheskie i gistokhimicheskie izmeneniya slizistoy obolochki zheludka krys pri podostrom otravlenii khlorofosom. [Morphological and histochemical changes in the gastric mucosa of rats undergoing subacute chlorophos poisoning.]** *Farmakol. Toksikol. (Moscow)* 40(4): 451-454; 1977. (10 references) (Russian)

Ninety-four male Wistar rats received chlorophos (trichlorfon) ig for 21 days. The daily doses ranged from 0.5 LD50 (250 mg/kg) to 0.1 LD50 (5 mg/kg). The animals were killed 1 or 9 days after the poisoning. Trichlorfon caused slight changes in the structure of the gastric mucosa. The changes included dilation of the fundic glands, separation and aggregation of the chief cells, homogenization of their cytoplasm, hyperemia of the mucosa,especially in the upper part of the stomach, and reduction of the acid phosphatase activity of the gastric mucosa. These changes, observed 1 day after poisoning, were dose-dependent; there were only very slight changes in the group treated with 5 mg/kg. More or less complete normalization of the morphological and histochemical changes were seen 9 days after the poisoning.

78-0874. Yurchenko, V. V. (All-Union Sci. Res. Inst. Disinfect. Steril., Moscow, USSR) **Tsitogeneticheskoe issledovanie mutagennykh svoystv repellentov dimetilftalata i *N,N*-dietilamide fenoksiuksusnoy kisloty. [Cytogenetic investigation of mutagenic properties of the repellents dimethylphthalate and phenoxyacetic acid *N,N*-dimethylamide.]** *Farmakol. Toksikol. (Moscow)* 40(4): 454-457; 1977. (6 references) (Russian)

The mutagenic effects of dimethylphthalate (DMP) and phenoxyacetic acid *N,N*-diethylamide (P-203) were studied in mongrel male mice and male albino rats. The mice received single doses corresponding to 0.2 LD50 (1,400 mg/kg of MDP and 250 mg/kg of P-203) ig, after which the mutagenic effect was determined by bone marrow cell metaphase analysis. The frequency of chromosome aberrations was 2.88% in the mice treated with MDP and 4.8% in mice treated with P-203, vs. 1.88% in the controls. Fragments and chromatid exchanges accounted for all aberrations in the mice treated with P-203, but there were no chromatid exchanges in the bone marrow cells of mice treated with DMP. When applied on the skin in a single dose of 1,250 mg/kg, DMP and P-203 caused no significant change in the frequency of chromosomal aberrations in the hepatocytes of the regenerating liver of partially hepatectomized rats. Both substances caused significant increases in the chromosomal aberrations in the hepatocytes after 21-23 applications of the same dose during a 1 mo period: DMP increased the frequency of aberrations to 7.5%, P-203 to 7.66% vs. 4.50% in the control. The findings indicate the existence of mutagenic effects of DMP (after repeated skin application) and P-203 (after ip and repeated skin application).

78-0875. Zolotnikova. G. P. ; Dorofeev, V. M. (Pestic. Lab., All-Union Sci. Res. Inst. Agric. Labor Protect., Orel, USSR) **Zashchitoe deystvie nekotorykh vitaminov i aminokislot ot tsitotoksicheskogo effekta fosfamida i akrelesa. [Protective action of some vitamins and amino acids against cytotoxic effects of phosphamide and acrex.]** *Farmakol. Toksikol. (Moscow)* 41(2): 186-188; 1978. (Russian)

Tests were performed on embryonic fibroblast cells, indicating the possibility that vitamin C, vitamin B_1, folic acid, and methionine could prevent toxic effects from dimethoate and dinobuton. The degeneration factor due to the cytotoxic effects of dimethoate was appreciably lowered when vitamin C, methionine, folic acid, choline hydrochloride, and vitamin B_1 were present. The degeneration factor produced by dinobuton was appreciably lowered by adding vitamin B_1, vitamin B_2, vitamin B_{12}, vitamin C, folic acid, or methionine to the incubation medium. Further investigations of these substances in animals are recommended, with the goal of practical recommendations regarding their use to prevent toxic effects in humans.

78-0876. Pritchard, J. B. (NIEHS, NIH, Research Triangle Park, NC 27709) **Transport of 2,4-dichlorophenoxyacetic acid (2,4-D) by winter flounder kidney *in vitro* and *in vivo*.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 922; 1978.

The role of the organic acid transport system in the excretion of the herbicide, 2,4-D, was examined in the winter flounder, *P. americanus*, using teased renal tubules *in vitro* and clearance techniques *in vivo*. *In vitro* incubation of tubules with 1 μM ^{14}C-2,4-D for 60 min at 15°C gave tissue-to-medium ratios (T/M) of 30. Metabolic inhibitors reduced the T/M to only 1.8. Other organic acids also gave dose-dependent inhibition. Addition of plasma to the incubation medium reduced 2,4-D uptake in proportion to the degree of 2,4-D binding by the added proteins. The kinetics of 2,4-D uptake gave a *Km* of 78.8 μM and *Vm* of 3.9 μmol/hr/g. Using 2,4-D as an inhibitor of PAH uptake gave a *Ki* of 44 μM. Unlike 2,4,5-T in mammals, 2,4-D did not alter organic base transport in the fish tubules *in vitro*. After injection of 2.5 μmol/kg im plasma ^{14}C-2,4-D was ca 1 μM and the clearance of 2,4-D averaged 175 ml/hr or 487 times the GFR. Other organic acids (25 μmol/kg) reduced C, (2,4-D) to only 20 ml/hr. Increasing plasma 2,4-D levels to 10-60 μM caused self-inhibition with C(2,4-D) of only 51.4 ml/hr. The calculated maximum tubular transport averaged 847 nmol/hr/g kidney. Finally, in keeping with the kinetic data above, 2,4-D did inhibit PAH clearance *in vivo*, but to a lesser extent than chlorophenol red or probenecid which have lower *Ki*. Thus it appears that the extensive uptake of 2,4-D *in vitro* is mediated by the organic acid system and that this transport results in effective elimination of 2,4-D by the intact fish. (Author abstract by permission)

78-0877. Smith, C. C. ; Cragg, S. T.; Wolfe, G. F. (Dep. Environ. Health, Coll. Med., Univ. Cincinnati, Cincinnati, OH 45267) **Subacute toxicity of 1,2,4-trichlorobenzene (TCB) in sub-human primates.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 248; 1978.

Doses of TCB from 1 to 173.6 mg/kg have been administered to rhesus monkeys for the purposes of defining both the toxic and apparently non-toxic levels. Single oral daily doses of 25 mg/kg or less were non-toxic whereas doses of 90 mg/kg or higher were toxic and doses of 173.6 mg/kg were lethal within 20-30 days. The high dose monkeys gave evidence of hepatic induction as shown by a shift in the urinary pattern of chloroguanide metabolites and increased clearance of iv doses of labeled TCB. Animals on the highest dose exhibited severe weight loss and had fine tremors, the latter being most pronounced a few days before death. Terminally, they had elevated levels of urea N, Na, K, CPK, SGOT, SGTP, LDH, and ALK T ase, as well as hypercalcemia and hyperphosphatemia. There was no evidence of jaundice. The clinical symptoms and biochemical changes were quickly reversed when treatment was discontinued. No evidence of mutagenic activity was detected for the parent compound or for any of 6 known or potential metabolites. (Author abstract by permission)

78-0878. Schein, L. G. ; Donovan, M. P.; Thomas, J. A. (Dep. Pharmacol., West Virginia Univ. Med. Ctr., Morgantown, WV 26506) **Ability of parathion (P) to lower plasma testosterone and competitively inhibit binding of dihydrotestosterone-^{3}H (DHT^{3}H) to mouse prostate receptors.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 286; 1978.

Previous studies reported that varying doses of parathion (P) had no effect upon the uptake of testosterone-^{3}H (T-^{3}H) by the prostate and also failed to alter the metabolism of (T^{3}H) to its principal non-polar radiometabolites. In the present studies, using doses of (P) known to suppress prostate gland weights, experiments were designed to examine the bioconversion of (T-^{3}H) in both the prostate and the liver. (P) (5 mg/kg daily x 10 po) failed to interfere with the prostate gland's ability to convert (T-^{3}H) to (DHT-^{3}H). Likewise, (P) (10 μM) did not affect conversion of (T-^{3}H) to (DHT-^{3}H) *in vitro*. (P) *in vitro*, but not when orally administered, inhibited the ability of hepatic microsomal enzymes to metabolize (T-^{3}H) to its principal polar radiosteroids (e.g. 6β; 7α; 16α-hydroxy testosterone-^{3}H). (P) (2.5 or 5 mg/kg daily x 10 po) caused significant ($P < 0.05$) reductions in plasma testosterone. (P) (10-^{6}M) effectively inhibited the *in vitro* binding of (DHT-^{3}H) to prostate cytosol receptors. (P) actions upon the endocrine system are complex, and are mediated not only through changes in androgen metabolism in the prostate glands and the liver, but this pesticide interferes with the binding of (DHT-^{3}H) to its receptor(s). (Author abstract by permission)

78-0879. Mehendale, H. M. ; Ho, I. K.; Desaiah, D. (Dep. Pharmacol. Toxicol., UMC, Jackson, MS 39216) **Mirex-induced interference of energy metabolism and hepatobiliary dysfunction.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 463; 1978.

Previous work with isolated perfused rat livers has shown that preexposure to mirex (M) results in hepatobiliary dysfunction. Objectives of the present studies include confir-

mation of these observations in intact animal preparations, the effect on hepatic mitochondrial Mg^{++} ATPase (MATPase) as well as microsomal Na^{+}-K^{+} ATPase activities, and possible correlationship with M-induced impairment of biliary excretory function. Male Sprague-Dawley rats (300-325 g) were treated with M, po, at 5, 10 and 50 mg/kg/day in 0.4 ml corn oil for 3 days. Controls received corn oil only. Forty-eight hrs after the last treatment one group of animals was surgically prepared: femoral vein, femoral artery and common bile duct were cannulated and renal pedicles were ligated under pentobarbital anesthesia. Polar metabolites of ^{14}C-imipramine (IMP) or phenolphthalein glucuronide (PG) (10 mg/kg) was injected iv and timed bile and blood samples (0.3 ml) were collected up to 60 min. A second group of animals was used for the assay of hepatic ATPase activities. Biliary excretion of ^{14}C-IMP metabolites was suppressed at all levels of M. Biliary excretion of PG was suppressed at the two high doses of M. MATPase and microsomal $Na^{\pm}$-$K^{\pm}$ ATPase activities were inhibited by preexposure to M. These results are suggestive of involvement of M-induced interference with hepatic energy metabolism in the manifestation of hepatobiliary dysfunction. (Author abstract by permission)

78-0880. Hewett, W. R. ; Cote, M. G.; Plaa, G. L. (Univ. Montreal, Montreal, P.Q., Canada) **Acute alteration of chloroform-induced hepato- and nephrotoxicity by Mirex and Kepone.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 403; 1978.

$CHCl_3$, a potent hepato- and nephrotoxin, has been identified as a contaminant of drinking water. Several chemicals are known to modify the toxic potential of $CHCl_3$. This preliminary study was designed to determine the capacity of two environmental pollutants, Mirex (M) and Kepone (chlordecone), to modify the toxicity of $CHCl_3$. M and K were administered (50 mg/kg, po) to male Swiss-Webster mice. After 18 hr a challenge dose of $CHCl_3$ (0.1 ml/kg, po) was administered. Liver and kidney damage were determined 24 hr later, using plasma glutamic-pyruvic transaminase (GPT), plasma ornithine carbamyl transferase (OCT) activity, and altered renal cortical slice accumulation of *p*-aminohippurate (PAH) and tetraethylammonium (TEA) ion. M alone produced significant hepatomegaly but no toxicity. K alone was similarly without toxic effect. The $CHCl_3$ challenge increased GPT activity without altering OCT activity and decreased kidney slice PAH and TEA uptake. M pretreatment protected against the $CHCl_3$-induced decrease in TEA uptake but did not alter $CHCl_3$ hepatotoxicity or depression of PAH uptake. In contrast, K pretreatment potentiated $CHCl_3$ hepatotoxicity (increases of 39-fold and 25-fold in GPT and OCT respectively). K did not markedly alter $CHCl_3$ nephrotoxicity. These results suggest that K ingestion may increase the sensitivity of hepatocytes to $CHCl_3$ toxicity. (Author abstract by permission)

78-0881. Bulger, W. H. ; Muccitelli, R. M. (Worcester Found. Exp. Biol., Shrewsbury, MA 01545) **Interactions of DDT analogs with the 8S estrogen-binding protein in rat testes.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 423; 1978.

The effect of certain DDT analogs on the binding of ^{3}H-estradiol to the 8-9S estrogen binding protein of rat testicular cytosol was studied by sucrose sedimentation analysis. The binding of ^{3}H-estradiol to testicular cytosol was inhibited by *o,p'*-DDT, a DDT analog which is estrogenic in the intact female, but not by *p,p'*-DDE which is a non-estrogen in the female. The pesticide methoxychlor, which is estrogenic *in vivo* in the female, but which nonetheless does not inhibit ^{3}H-estradiol binding to the uterine estrogen receptor, also failed to inhibit ^{3}H-estradiol binding in rat testicular cytosol. However its di-demethylated metabolite 2,2-bis(*p*-hydroxyphenyl)- 1,1,1-trichloroethane (HPTE), also estrogenic *in vivo*, and which inhibits ^{3}H-estradiol binding to uterine estrogen receptor, caused marked suppression of ^{3}H-estradiol binding to testes 8S binding protein. (Author abstract by permission)

78-0882. Deckert, F. W. ; Godfrey, W. J.; Lisk, D. C.; Steigerwalt, R. B.; Udinsky, J. R. (Res. Lab., Rohm Haas Co., Spring House, PA 19477) **Metabolic interactions with RH-787 (Vacor rodenticide).** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 424; 1978.

Hepatic metabolism of the rodenticide RH-787 (*N*-3-pyridyl- methyl-*N*- *p*-nitrophenyl urea) plays a key role in species sensitivity differences. 3-MC pretreatment of rats enhanced their hepatic extraction of ^{14}C-787, increased biliary secretion of its metabolites and protected them against 787 toxicity. Dogs natively showed more efficient hepatic extraction of 787, leading to its rapid metabolic degradation. Rats tolerated chronic sublethal 787 levels, but most tissues showed ^{14}C accumulation after multiple ^{14}C-787 doses. Since this was more pronounced for pyridyl- than nitrophenyl-^{14}C, metabolic cleavage products were suspected. Pretreatment of rats with multiple 787 doses enhanced urinary and fecal ^{14}C excretion after pulse doses of ^{14}C-787, but prolonged hexobarbital sleeping times and strongly inhibited hepatic *p*-nitroanisole *O*-demethylation *in vitro*; the latter was also inhibited by direct *in vitro* 787 addition. Antidotal levels of nicotinamide (NA) did not prevent MFO inhibition by 787, but altered ^{14}C-787 disposition. Higher NA levels also inhibited the MFO. High affinity for microsomal enzymes may explain NAD-antagonism by 787 via glycohydrolase and make it useful as a model compound. Concentrates of urinary and biliary 787 metabolites and synthetic metabolites (amino-787, *p*-nitroaniline, *p*-nitrophenyl urea) were less toxic than 787. These observations support the proposal that the net effect of 787 biotransformation is its detoxication. (Author abstract by permission)

78-0883. Hammond, B. ; Bahr, J.; Dial, O.; McConnel, J.; Metcalf, R. (Inst. Environ. Stud., Univ. Illinois, Urbana, IL 61801) **Reproductive toxicology of mirex and kepone.** *Fed. Prod. Fed. Am. Soc. Exp. Biol.* 37(3): 501; 1978.

Mirex (M) and kepone (K, chlordecone) have been found to interfere with reproduction in several species,including man. M and K are potent inducers of mixed function oxidase and may affect fertility by stimulating the hepatic

degradation of steroids. To examine the mode of action of these compounds, adult male and female rats were maintained on diets of M or K (30 ppm). Plasma steroid and gonadotrophin levels were monitored by RIA. Liver wt. increased significantly for male and female M and K rats. In the males, testosterone levels were similar at 1, 2 and 8 weeks, but were higher in K rats at 4 weeks. LH levels fluctuated irregularly. Testis wt. was unaffected by M and K but seminal vesicle wt. increased at 1 and 2 weeks in M rats and decreased at 8 weeks in K rats. K rats (7 weeks) yielded smaller litters than M or control rats when mated with control females. Reproduction in female rats was markedly affected by K. After 8 to 10 weeks of treatment, K rats were in constant estrus. All rats were killed at 10 weeks during the estrus phase of their cycles. Estradiol levels were low in K rats while LH levels were decreased in both M and K rats. FSH levels did not differ. Uterine wts. (ballooned) were higher in K rats while their ovarian wts. were lower than M or control rats. It was apparent that K had a greater adverse effect on reproduction than M. The toxic mechanisms of these compounds are being investigated further. (Author abstract by permission)

78-0884. Gasiewicz, T. A. ; Neal, R. A. (Cent. Toxicol., Vanderbilt Univ., Nashville, TN 37232) **Tissue distribution and excretion of 2,3,7,8-tetra chlorodibenzo-*p*-dioxin (TCDD) and effects upon clinical chemical parameters in the guinea pig.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 501; 1978.

The tissue distribution and excretion of ^{14}C-TCDD in adult male guinea pigs was studied for up to 15 days following its ip injection (2.0 μg/kg B.W., 0.14 μCi/μg). On day 1 the highest levels of radioactivity (% or original dose/g tissue) were located in the adipose tissue (2.36), adrenals (1.36), liver (1.13), spleen (0.70), intestine (0.42), and skin (0.48). All other tissues examined contained less than 0.3%/g tissue. The level of ^{14}C-TCDD in the liver increased to 3.23%/g on day 15. An increase in ^{14}C-TCDD was also noted in the adrenals, kidneys, and lungs, while only adipose tissue and skin demonstrated general decreases in radioactivity. For the 15 days of the experiment the total urinary and fecal excretion of radioactivity was less than 1% and 5%, respectively. The effect of TCDD (1.0 μg/kg) upon plasma levels of Na, K, Cl, CO_2, Fe, Ca, inorganic P, alkaline phosphatase, SGOT, SGPT, LDH, glucose, urea nitrogen, creatinine, uric acid, total protein, albumin, cholesterol, triglycerides, and bilirubin was determined periodically up to 14 days and compared to pair-fed control animals. Statistically significant increases in plasma albumin, total protein, Fe, urea nitrogen, cholesterol, and triglycerides were observed in TCDD-treated guinea pigs. (Author abstract by permission)

78-0885. Trottman, C. H. ; Desaiah, D. (Dep. Chem., Jackson State Univ., Jackson, MS 39216) **Effect of toxaphene on ATPase activities in mouse tissues.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 502; 1978.

The effects of toxaphene (T), a polychlorinated camphene, on Na±-K± and Mg±± ATPase activities in mouse tissues were determined both *in vitro* and *in vito.* The Na± -K± ATPase activity in brain and kidney was inhibited by T with an estimated IC50 of 7.5 μM. The oligomycin-sensitive (0.S.) Mg±± ATPase in brain, kidney and liver was also inhibited in a dose-dependent manner with IC50 values of 15, 15 and 20 μM, respectively. The oligomycin-insensitive (O.I.) Mg±± ATPase in all tissues examined. For *in vivo* study, male ICR mice were orally fed with T in corn oil at 10, 25 and 50 mg/kg/day for 3 days and the controls received corn oil only. A 40% mortality was observed in the 50 mg/kg/day group. Thirty-six hr after the last treatment the animals were sacrificed, brain, kidney and liver were removed, fractionated and ATPase activities were determined. The hepatic and renal ATPase activities were significantly decreased in T-treated mice as compared to controls. Interestingly, the brain ATPases by T suggests that this pesticide may be interfering with hepatic and renal functions. (Author abstract by permission)

78-0886. Abou-Donia, M. B. ; Ashry, M. A. (Dep. Pharmacol., Duke Univ. Med. Cent., Durham, NC 27710) **Metabolism of leptophos by liver microsomal enzymes: A factor in species selectivity to delayed neurotoxicity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 504; 1978.

The metabolic fate of the neurotoxic insecticide leptophos was studied *in vitro* to elucidate the role of enzymatic degradation in species sensitivity to delayed neurotoxicity. In separate experiments, ^{14}C-leptophos or ^{14}C-leptophos oxon was incubated with liver microsomal fractions from cats and hens (susceptible species) and rats and hamsters (non-susceptible species). Limited hydrolysis of leptophos was found in all species, with susceptible species showing the least hydrolysis. Desulfuration of leptophos to leptophos oxon was more dominant n the rats and hamsters than in the hen and the cat. Also, while leptophos oxon was moderately hydrolyzed by susceptible species, it was greatly hydrolyzed by nonsuceptible species. The results showed that degradation of leptophos involves the action of an oxidative enzyme in the microsomal fraction of the liver followed by hydrolysis. The results also demonstrated that the rate of detoxification of leptophos is correlated with the *in vivo* susceptibility of the tested species to delayed neurotoxicity. It is concluded that lephotphos metabolism is a contributing factor in species selectively to delayed neurotoxicity. (Author abstract by permission)

78-0887. Andrews, L. S. ; Menard, R. H.; Maling, H. M.; GIllette, J. R. (NIH, Bethesda, MD 20014) **The effect of *o,p*-DDD (mitotane) administration on mitochondrial and microsomal cytochrome P-450 in adrenal of male dogs.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 644; 1978.

It is known that the iv administration of *o,p'*-DDD (50 mg/kg) to dogs causes a moderate degree of necrosis of adrenal cells within 4-5 hr and a 30-40% loss of microsomal and mitochondrial P-450 in the adrenal gland. In the present study, *o,p'*-DDD was administered to dogs either iv (50 mg/

kg) or orally in daily doses of 12.5, 25 and 50 mg/kg for 3 days. At 60-70% no decrease occurred at 12.5 and 25 mg/kg. In contrast, the amount of mitochondrial P-450 decreased by 50-60% at 25 mg/kg, and 90-97% at 50 mg/kg,with no decrease at 12.5 mg/kg. With a single iv dose, moderate necrosis of adrenal cells occurred at 4-5 hr with a 50-60% loss in microsomal TPNH cytochrome c reductase, P-450 and cytochrome b_5, and a 35-40% loss in mitochondrial P-450 and cytochrome b, $c+c_1$ and $a+a_3$. Pretreatment of dogs with spironolacetone (100 mg/kg, iv), which depletes microsomal but not mitochondrial P-450, prevented the necrosis and the further loss in the microsomal but not the mitochondrial enzymes. Thus, adrenal necrosis caused by *o,p'*-DDD was not associated with a decrease in the amount of mitochondrial enzymes nor apparently was it associated with alterations in nuclear DNA since *o,p'*-DDD was not mutagenic in the Ames Salmonella mutagenic assay. (Author abstract by permission)

78-0888. Teitelbaum, P. J. ; Poland, A. P. (Dep. Pharmacol. Toxicol., Univ. Rochester, Rochester, NY 14642) **Studies of the hepatic uptake of 2,3,7,8-tetra chlorodibenzo-*p*-dioxin in the mouse.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 692; 1978.

2,3,7,8-Tetra chlorodibenzo- *p*-dioxin (TCDD), a potent inducer of cytochrome P-450-mediated monooxygenase activities, accumulates in the livers of exposed animals and is eliminated slowly with no appreciable metabolism. The hepatic uptake of a tracer dose of ^{3}H-TCDD in Swiss Webster mice was found to be markedly increased by pretreatment with non-labeled TCDD. Control mice and mice pretreated with TCDD (3×10^{-7} mol/kg) for 36 h, were administered ^{3}H-TCDD (1×10^{-10} mol/kg) ip. Hepatic uptake of ^{3}H-TCDD was maximal after 12 h and equivalent to 11.7% of the total dose for control,and 60.9% for TCDD-pretreated animals. The increase in hepatic uptake of ^{3}H-TCDD is recoverable in the particulate fractions and is dependent on the pretreatment dose with an ED50 of 8×10^{-10} mol/kg. Liver homogenates from TCDD-pretreated mice, when incubated with ^{3}H-TCDD in vitro, bound 5.3 times as much radiolabel as homogenates from control mice. Similarly, pretreatment increased the in vitro binding capacity of isolated nuclei, mitochondria, and microsomes, but no changes in cytosol binding was observed. These results suggest that the increased in vivo hepatic uptake of ^{3}H-TCDD following TCDD pretreatment is caused by the large increase in the capacity of liver particular fractions to bind ^{3}H-TCDD. (Author abstract by permission)

78-0889. Ragland, W. L. ; Buynitzky, S. J. (Univ. Georgia, Athens, GA 30605) **Effect of viral infection on drug metabolism and pesticide disposition in ducks.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 693; 1978.

The influence of duck hepatitis virus (DVH) on hepatic drug metabolism was investigated using adult Mallard ducks. Mallard drakes were fed 900 ppm DDT and were killed at various times over periods of 10 or 12 days. Pesticide analysis by electron-capture gas chromatograhy revaled an enhanced *in vivo* biotransformation of DDT in mallards infected with DHV. Concentrations of DDT were lower in the serum of infected ducks, while the concentration of the metabolite DDD (TDE) was significantly higher ($p < 0.001$) in the bile of infected ducks throughout the 12-day feeding trial. The ratio of biliary DDD to DDE increased steadily in both control and DHV-treated groups, but was significantly higher ($p < 0.01$) among the virus-treated birds indicating a preferential induction of the microsomal dechlororeductase activity which produces DDD. During most of the 12 day period there were no differences in microsomal enzyme activity between ducks given DHV 48 hr prior to the feeding regimen and noninfected controls. But after 8 days on the contaminated feed the ducks given virus had significantly greater aryl hydrocarbon hydroxylase (AHH) and aniline hydroxylase (AH) activities, and 29% higher ethylmorphine *N*-demethylase (ND) activity, relative to controls. (Author abstract by permission)

78-0890. Chambers, J. E. ; Yarbrough, J. D. (Mississippi State Univ., Mississippi State, MS 39762) **Aldrin metabolism in insecticide-resistant and susceptible mosquitofish.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 693; 1978.

An insecticide-resistant (R) population of *Gambusia affinis* demonstrated a 71 fold resistance over a susceptible (S) population to aldrin (48 hr LC50 values: 2558 and 36 ppb, respectively). To assess the role of aldrin metabolism in resistance, fish of both populations were exposed to 80 ppb ^{14}C-aldrin for a 6 hr period, and hepatic levels of aldrin, its epoxide dieldrin and water-soluble components were determined. There was generally greater uptake of aldrin into S fish livers. The R fish usually converted a greater percentage of aldrin to the more toxic dieldrin although the greater aldrin uptake in the S fish resulted in more dieldrin in S fish livers. Less aldrin epoxidation occurred in both populations in later summer, which agrees with the observed seasonal variation in mosquitofish mixed-function oxidase components. Water-soluble components comprised a very small percentage of total radioactivity in both populations. Ratios of radioactivity in gall bladders to that in livers were similar in both populations. A 2 day pre-exposure to 10 ppb of the insecticide toxaphene decreased the hepatic uptake of aldrin in both populations. It appears that aldrin metabolism does not play a major role in aldrin resistance. (Author abstract by permission)

78-0891. Robinson, K. M. ; Yarbrough, J. D. (Mississippi State Univ., Mississippi State, MS 39762) **A study of mirex induced changes in liver metabolism and function with emphasis on liver enlargement.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 699; 1978.

The induction of liver enlargement by mirex in rats was investigated. A single dose of mirex to rats produced rapid liver enlargement (100% increase within 4 days), which is not a response to liver cell damage as tested by changes in glutamate-oxaloacetate transaminase (GOT) and glutamate-pyruvate transam (GPT) activity in the liver and serum. Enlargement represents an increase in total liver protein, lip-

id, carbohydrate, and nucleic acid. The liver returns to near normal size within 28 days after a single dose of mirex. Compared to controls, the enlarged liver has similar or increased functional capacity as demonstrated by sulfobromophthalein clearance, cytochrome P450 concentration, serum protein electrophoretic pattern, serum total protein, lipid, and glucose concentration, and the liver response to epinephrine. The dramatic increase in liver mass is a specific response to mirex, and to date no liver dysfunction has been observed. (Author abstract by permission)

78-0892. Koschier, F. J. ; Girard, P. R.; Hong, S. K. (Dep. Physiol., State Univ. New York, Buffalo, NY 14214) **Transport of 2,4-dichlorophenoxyacetate (2,4-D) by rat renal cortical slices.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 922; 1978.

The herbicide, 2,4-D, has been shown previously to be accumulated by renal slices in a manner similar to *p*-amino- hippurate (PAH). The present study characterized the efflux of 2,4-D from preloaded renal slices. The efflux curve for 2,4-D is comprised of a fast and a slow component which have a first-order rate constant (min^{-1}) of 0.254 and 0.016, respectively. Both rate constants are increased by competitive and metabolic inhibitors; however, unlike PAH, no biphasic response was noted with increasing concentrations of probenecid or dinitrophenol. The efflux of 2,4-D into a Ca ±±-free medium was unaltered; however, when a K±-free medium was used, the slow component was increased. As with PAH efflux, the slow component of 2,4-D efflux was decreased in the presence of lactate, but this effect was not observed for the fast phase. The rate of initial influx of 2,4-D when compared to 2,4-D efflux was rapid enough to account for the fact that this compound, at low media concentrations, continues to be concentrated within the tissue and does not exhibit a steady-state level of transport. In addition, 2,4-D is a potent inhibitor of the organic anion system since a concentration of approximately 20 μM 2,4-D produces a 50% inhibition of PAH transport. These characteristics of 2,4-D transport can be correlated to the relatively slow rate of *in vivo* excretion of this herbicide. (Author abstract by permission)

78-0893. Holevinski, T. S. ; Massaro, E. J. (Dep. Biochem., Sch. Med., State Univ. New York, Buffalo, NY 14214) **The effects of gestational exposure to mirex on offspring of the mouse.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 37(3): 938; 1978.

The 7 day LD50 for intragastrically administered mirex in HA/ICR Swiss mice was calculated at 155.5 ppm in males and 160.2 ppm in females. Administration of 2 mg/kg body weight to pregnant females at 48 hour intervals throughout gestation produced no significant alterations in open-field behavior (ambulations and rearings) or in postnatal maternal pup retrieval. The body weights of offspring differed significantly ($p < 0.025$) on day 12 post partum, but not on days 7, 21, or 40. The gross motor activity (activity board) of the offspring was significantly ($p < 0.01$) depressed on day 7, but not on day 12, and day 40 open-field behavior was unaffected. On day 33, a marginal ($p < 0.088$) decrease in wheel running activity was observed while on day 41, rotarod performance was significantly ($p < 0.04$) depressed. In all behavioral tests, male offspring exhibited greater deviation from control performance than did females. Histopathological investigation of the CNS of adult male offspring indicated moderate cerebral edema and moderate, generalized demyelination and neuronal degeneration. There was a relative reduction in the number of neurons of the granular layer of the cerebellum and degeneration of the Purkinje cells. Liver and muscle were unaffected. (Author abstract by permission)

78-0894. Novakova, S. ; Dinoeva, S. (Ctr. Hyg., Acad. Med., Sofia, Bulgaria) **Eksperimental'noe obosnovanie predel'no dopustimoy kontsentratsii dimida v vode vodoemov. [Experimental substantiation of the maximum allowable concentration of dimide in water bodies.]** *Gig. Sanit.* 40(12): 75-78; 1975. (4 references) (Russian)

The toxicological properties of dimide (diphenamid, *N,N*-dimethyldiphenylacetamide) were studied to establish its maximum allowable concentration in water bodies. The highest concentration at which it did not alter the organoleptic properties of water was 6 mg/liter, and the odor threshold was 8 mg/liter of water. The highest concentration at which dimide did not reduce the biological oxygen consumption was 48 mg/liter. The acute oral LD50 was found to be 1250 mg/liter in albino rats. The cumulation factor was 21.5. Chronic oral poisoning tests in albino rats over 6 months revealed a maximum no-effect level of 4 mg/kg (80 mg/liter). A high dose of 40 mg/kg/day caused slight retardation of weight gain, significant reduction of the hemoglobin level at the end of the experiment, reduction of the erythrocyte count, and significant increase of the cytochrome oxidase activity in kidney homogenates. The findings suggest that the maximum allowable concentration of dimide in water bodies should be set at 6 mg/liter on the basis of the organoleptic properties as limiting criteria.

78-0895. Khamidov, D. Kh. ; Demidenko, N. M.; Nishanbaev, K. N.; Zhuravlev, R. A.; Bakhadyrov, M. A. (Tashkent Med. Inst., Tashkent, USSR) **Obshchaya morfologiya i ul'trastruktura kletok krovi i kostnogo mozga pri ostrom otravlenii insektitsidom antio v eksperimente. [General morphology and ultrastructure of blood and bone marrow cells following acute experimental poisoning by anthio.]** *Gig. Sanit.* 42(12): 89-90; 1977. (Russian)

Morphological and ultrastructural changes were studied in blood and bone marrow cells of cross-bred male white mice 1-30 days after the administration of a single intragastric dose of anthio (formothion, 150 mg/kg). The morphological changes observed reached their maximum 5-10 days after poisoning. They included reduced hemoglobin levels, erythrocytopenia, the appearance of metamyelocytes, increased percentage of stab cells, temporary increase of the segmented cell count, and phasic changes in the lymphocyte and eosinophil counts in the peripheral blood. Increased

numbers of immature myeloid cells (myelocytes, metamyelocytes and stab cells), reduced segmented cell count, steady depression of the lymphoid cells, and slight depression of the eosinophils were seen in the bone marrow. The ultrastructural changes included compaction of the chromatin and dilation of the perinuclear zone in erythroblasts and lymphocytes; hypertrophy of the Golgi complex, especially in plasma cells; and swelling of the mitochondrial matrix, disorganization of the cristae, pyknosis, and karyolysis of the immature cells of the erythroid and myeloid series in the bone marrow. The ultrastructural changes were most pronounced during the first few days after poisoning, and a beginning of normalization was seen after 10 days. Cells with ultrastructural changes were hardly seen 30 day after the poisoning.

78-0896. Reddy, T. G. ; Gomathy, S. (Dep. Zool., Annamalai Univ., Annamalainagar, India) **Toxicity and respiratory effects of pesticide, thiodan on catfish, *Mystus vittatus*.** *Indian J. Environ. Health* 19(4): 360-363; 1977. (11 references)

Catfish were placed in water containing various concentrations of Thiodan (endosulfan). The TLm values were 0.00032 mg/l for 24 hr of exposure, 0.00026 mg/l for 48 hr, and 0.00024 mg/l for 96 hr. Oxygen consumption decreased from 122.73 mg/kg/hr to 65.98 mg/kg/hr in fish moved from untreated water to water containing 0.0001 mg/l Thiodan, a sublethal concentration. Oxygen consumption increased from 102.31 mg/kg/hr to 151.13 mg/kg/hr in fish moved from untreated water to water containing 0.0004 mg/l Thiodan, a lethal concentration. Behavioral effects such as hyperactivity and darting movements probably account for the increased oxygen consumption. In both cases the fish remained in the water containing the pesticide for 2 hr.

78-0897. Kawatski, J. A. ; Ledvina, M. M.; Hansen, C. R., Jr. (Dep. Biol., Viterbo Coll., La Crosse, WI) **Acute toxicities of 3-trifluoromethyl- 4-nitrophenol (TFM) and 2',5-dichloro-4'-nitrosalicylanilide (Bayer 73) to larvae of the midge (*Chironomus tentans*).** *Invest. Fish Control* (57): 3-7; 1975. (11 references)

The toxicities of varying doses of the lampricide TFM and the molluscicide Bayer 73 (clonitralide) to *Chironomus tentans*, a benthic midge, were investigated. The toxicants, dissolved in 0.5 ml of 50% acetone in water, were introduced into beakers containing midges in 900 ml of water. The concentration of toxicant, based on total formulation weight, that immobilized 50% of the test organisms (EC50) was determined. For TFM in soft water, these values ranged from 1.65 mg/l at 8 hr to 0.534 mg/l at 96 hr. For TFM in hard water, they ranged from 6.47 mg/l at 3 hr to 0.998 mg/l at 96 hr. For very hard water, they ranged from 14.3 mg/l at 8 hr to 2.10 mg/l at 96 hr. For Bayer 73 in soft water they ranged from 0.744 mg/l at 8 hr to 0.228 mg/l at 96 hr. In hard water they ranged from 1.01 mg/l at 8 hr to 0.295 mg/l at 96 hr. In very hard water comparable values were 2.01 mg/l and 0.353 mg/l. For a mixture of 98 parts TFM and 2 parts Bayer 73 in soft water comparable values were 1.38 mg/l and 0.328 mg/l. When the mixture was used in hard water, comparable values were 4.33 mg/l and 0.657 mg/l. When it was used in very hard water, comparable values were 11.8 mg/l and 2.79 mg/l. When the mixture was used in soft water, results at 24 hr, 48 hr, and 72 hr indicated synergism. All other results indicated additive toxicity.

78-0898. Fremling, C. R. (Winona St. Coll., Winona, MN) **Acute toxicity of the lampricide 3-trifluoromethyl- 4-nitrophenol (TFM) to nymphs of mayflies (*Hexagenia* sp.).** *Invest. Fish Control* (58): 3-7; 1975. (5 references)

Hexagenia nymphs were placed in water containing various amounts of the lampricide TFM. When relatively hard water was used, the LD50 for 24 hr exposure was 6.00 mg/l at 21.8°C, 7.00 mg/l at 23.5°C, and 3.50 mg/l at 24.4 °C. The last increment may reflect biological variation among groups of nymphs rather than temperature influence. In relatively soft water the LC50 for 24 hr exposure was 4.75 µl/l at 18.2°C and 3.50 µl/l at 26.5°C. These concentrations are for 35.7% TFM based on active ingredient. A comparable LC50 in relatively hard water at 17° єрє ° µl/l at 18.2 C and 2.18 µl/l at 26.5°C for soft water and 3.90 µl/l at 17°C for hard water. In soft water at temperatures of 22-23°C 24 hr LC50 values on a comparable basis ranged from 2.50 µl/l at pH 6.5 to 174 µl/l at pH 9.5. Values for 48 hr ranged from 1.31 µl/l at pH 6.5 to 100 µl/l at pH 9.5.

78-0899. Sanders, H. O. ; Walsh, D. F. (Fish-Pestic. Res. Lab., Bur. Sport Fish. Wildl., Columbia, MO) **Toxicity and residue dynamics of the lampricide 3-trifluoromethyl-4- nitrophenol (TFM) in aquatic invertebrates.** *Invest. Fish Control* (59): 3-7; 1975. (13 references)

Mature scud, daphnids, 14-day-old crayfish, mature aquatic sowbugs, damselfly nymphs, and mayfly nymphs were exposed to varying concentrations of the lampricide TFM in water. After a plateau concentration was reached, scud were transferred to flowing water containing no TFM, and the decline in residues was measured. Static 96 hr toxicity tests indicated an LC50 of 57 mg/l for scud and 110 mg/l for crayfish for field grade TFM (35.7% active ingredient). LC50 values from flow-through chronic toxicity tests of field grade TFM ranged from over 100 for scud and crayfish at 1 day to 14 for scud at 20 and 30 days. Ratios of TFM concentration in the organism to TFM concentration in the water ranged from practically 0 after 1 day in damselfly to 89 after 14 days in scud exposed to 0.510 mg/l TFM. TFM concentration reached a plateau after 7 days in most organisms. Scud transferred to TFM-free water after having reached a plateau concentration eliminated 50% of the TFM in 3.5 days and 98% of the TFM in 14 days. Reproduction was not affected when three generations of daphnids were exposed to 2.4, 4.9, and 10 mg/l of field grade TFM. When daphnids were exposed to 18 mg/l field grade TFM, reproduction stopped within the first generation.

78-0900. Krieger, D. T. ; Condon, E. M. (Div. Endocrinol., Dep. Med., Mt. Sinai Med. Ctr., New York, NY

10029) **Cyproheptadine treatment of Nelson's syndrome: Restoration of plasma ACTH circadian periodicity and reversal of response to TRF.** *J. Clin. Endocrinol. Metab.* 46(2): 349-352; 1978. (15 references)

A 35-year-old woman presented with findings indicative of Cushing's disease. Urinary 17-hydroxycorticosteroid (OHCS) concentrations varied from 36 to 46 mg/24 hr and were unaffected by pituitary irradiation. A daily dose of 2.5 mg *o,p'*-DDD was given from September 1972 to October 1973. During this time urinary 17-OHCS concentrations became normal. The therapy produced side effects, and there was evidence of increased urinary 17-OHCS excretion when it was discontinued. After bilateral adrenalectomy, the patient was treated with 37.5 mg cortisone and 0.1 mg Florinef per day. Pigmentation and plasma ACTH concentrations increased. Treatment with cyproheptadine for 4 months resulted in skin lightening, decreased plasma ACTH concentrations, return of normal circadian periodicity of plasma ACTH concentrations, and lack of responsiveness of plasma ACTH concentrations to TRF.

78-0901. Jarvinen, A. W. ; Hoffman, M. J.; Thorslund, T. W. (Environ. Res. Lab.,US EPA Duluth, MN 55804) **Long-term toxic effects of DDT food and water exposure on fathead minnows (*Pimephales promelas*).** *J. Fish. Res. Board Can.* 34(11): 2089-2103; 1977. (50 references)

Fathead minnows (*Pimephales promelas*) were exposed during a partial chronic toxicity test to two DDT concentrations in the water, one in the diet, and combinations of water and diet for 266 days through a reproductive period of their life cycle. Tissue residue analyses were performed at preset intervals throughout the exposure and also on embryos, larvae at hatch, and 30- and 60-day progeny. The contribution of DDT from each source was monitored with gas chromatography and liquid scintillation techniques. The fish were fed a diet of clams that had accumulated ^{14}C-DDT when exposed at a DDT water concentration similar to that in the high fish exposure. Higher total DDT tissue residues were accumulated from the water than diet. Residues contributed by dietary DDT were additive to those from the water. Mean concentration factors were 1.2 for the diet and 100,000 for the water. Fish exposed to DDT in both water and diet had higher mortality rates than those exposed to only one or the other of these sources. DDT in the diet significantly reduced the probability of survival of the test fish ($P = 0.025$). Estimated maximum acceptable toxicant concentrations for DDT are 0.9 μg/l for fish exposed to DDT in the water only and 0.4 μg/l for fish exposed to DDT in both water and diet. Embryo residue levels and larval mortality rates were about twice as great for those from parent fish that had been exposed to DDT in both the water and diet as for those from parent fish exposed to only DDT in the water. (Author abstract by permission)

78-0902. Fitzpatrick, G. ; Sutherland, D. J. (Dep. Entomol. Econ. Zool., Rutgers Univ., New Brunswick, NJ 08903) **Residues in the salt marsh snail *Melampus bidentatus* Say (Bassommatophora: Ellobiidae).** *J. N.Y. Entomol. Soc.* 83(4): 267-268; 1975.

Salt marsh snails exposed in the field to temefos treatments of the type used in normal mosquito control were analyzed by gas chromatography to determine uptake of the mosquito larvicide. Measurable uptake of temefos took place within the first day after treatment with a 2% granular temefos formulation. When a temefos emulsion was used, uptake did not occur until after 3 weeks following treatment. When the granular formulation was used, residues in snails were generally about 1 ppm, and one sample reached 8.75 ppm. The highest residue when the emulsion was used was 0.059 ppm. Residues in snails were no longer detectable within 3 weeks after cessation of treatments with the emulsion; residues were detectable for over 5 weeks after treatment with the granular formulation was discontinued. This long period indicates that this insecticide can move in food webs that are exposed to the 2% granular formulation.

78-0903. Hartley-Asp, B. (Res. Lab., AB Leo, S-251 00 Helsingborg, Sweden) **The effect of caffeine and hydroxyurea on *Vicia faba* root-tip chromosomes previously exposed to maleic hydrazide.** *J. Supramol. Struct.* (Suppl 2): 95; 1978.

Hydroxyurea, which inhibits deoxyribonucleotide reductase, and caffeine, which inhibits repair, were tested to determine whether hydroxyurea inhibits repair of chromosomal breaks induced by maleic hydrazide. Breaks were induced in the chromosomes of *Vicia faba* root tips using maleic hydrazide. A combination of hydroxyurea and colchicine given after maleic hydrazide enhanced the aberration frequency, although to a lesser extent than caffeine. When combined hydroxyurea/colchicine and caffeine treatments were given after maleic hydrazide, potentiation of the chromosomal aberration frequency increased substantially over that for caffeine. Since this potentiation could be mimicked by combined caffeine/colchicine and caffeine treatments, the potentiation obtained with hydroxyurea is attributed to inhibition of DNA repair. Caffeine can sensitize lesions, making them more susceptible to inhibition of repair at a later stage in replication than unsensitized lesions. Different types of aberrations were found after caffeine treatment and hydroxyurea treatment.

78-0904. Abelentseva, G. M. ; Sedykh, A. S.; Popov, P. V.; Zhuravleva, V. I. (All-Union Sci. Res. Inst. Chem. Plant Protect. Agents, USSR) **Preparaty protiv koloradskogo zhuka. [Preparations for controlling Colorado potato beetle.]** *Khim. Sel'sk. Khoz.* 16(1): 40-43; 1978. (8 references) (Russian)

The pesticides used for controlling the Colorado potato beetle, their application rates, and toxicological parameters are presented. According to various literature sources the acute oral LD50 values of the preparations in rats are 1,000-8,800 mg/kg for valexon (phoxim), 82 mg/kg for triazophos, 30-110 mg/kg for thiodan (endosulfan), 5,000-9,000 mg/kg for dilor, 92-170 mg/kg for dursban (chlorpyrifos), (*O,O*-dimethyl-*O*- (quinoxalinyl-2-)- thiophos-

phate), 900 mg/kg for SAN 52056, 250-380 mg/kg for cartap (padan), 235-900 mg/kg for trichlorfon, 9-42 mg/kg for metaphos (methyl parathion), 195-310 mg/kg for SAN 155 (acid oxalate of 5-dimethylamino- 1,2,3-trithiane), 85-180 mg/kg for benzophosphate, 310-985 mg/kg for carbaryl, 245-455 mg/kg for cyanox, 295 mg/kg for heterophos (geterophos), 358 for TsGA 15324 (*O*-ethyl-*O*- (2-chloro-4-bromophenyl-2)- thiophosphate), 250-900 mg/kg for fenitrothion, 170-310 mg/kg for polychloropinene (strobane), 1,-900-5,000 mg/kg for tetrachlorvinphos, 117 mg/kg for heptenephos, 885-2,800 mg/kg for carbophos (malathion) and 300 mg/kg for TsGA 19795.

78-0905. Hornstein, L. ; Crowe, C.; Gruppo, R. (Cent. Dev. Disord., Univ. Cincinnati, Cincinnati, OH 45229) **Adrenal carcinoma in child with history of fetal alcohol syndrome.** *Lancet* 2(8051): 1292-1293; 1977. (10 references)

A 13-yr-old child is described with features of the fetal alcohol syndrome who had an adrenal carcinoma. The girl was born to a 39-yr-old chronic alcoholic. Strabismus and slow motor and mental development were noted in the child. At 21 mo of age there was facial asymmetry, hypertelorism, epicanthal folds, alternating esotropia, and questionable hemihypertrophy of the left. A cavernous hemangioma was noted in the occipital area. At 12 yr 11 mo the child was diagnosed as having a malignant tumor, which was traced to a non-secreting adrenocortical carcinoma with metastases to bone, lungs, liver, abdominal nodes, and bone marrow. She was treated with mitotane (*o,p'*-DDD) but died suddenly on day 41 of therapy. The question of whether intrauterine exposure to alcohol could lead not only to the fetal alcohol syndrome but also to malignant tumors must be considered.

78-0906. Harris, L. W. ; Heyl, W. C.; Stitcher, D. L.; Moore, R. D. (Biomed. Lab., Biosci. Div., Chem. Syst. Lab., US Army, APG, MD 21010) **Effects of atropine and/or physostigmine on cerebral acetylcholine in rats poisoned with Soman.** *Life Sci.* 22(10): 907-910; 1978. (15 references)

Cerebral acetylcholine (ACh) levels in normal animals were found to be 29.6 ± 1.4 (S.E.) nmoles ACh/g of wet tissue. Physostigmine and Soman reduced cerebral cholinesterase (ChE) activity to < 18% of control and increased cerebral ACh levels by 148 and 130% of normal, respectively. Neostigmine failed to alter ChE activity or ACh levels. Atropine decreased ACh levels to 62% of normal. When atropine was given with physostigmine or Soman, the ACh levels were almost normal. Soman failed to increase the levels of ACh in animals protected with atropine and physostigmine. When physostigmine was followed by Soman, cerebral ACh levels were lower than in animals given physostigmine only. Our data indicate that it may be possible to manage ACh concentrations in animals poisoned with irreversible ChE inhibitors by prior treatment with appropriate dosages of anticholinergic and reversible anti-ChE drugs. The data also suggest that ACh and/or anti-ChEs inhibit the synthesis of ACh. (Author abstract by permission)

78-0907. Burns, K. A. (Woods Hole Oceanogr. Inst., Woods Hole, MA) **Hydrocarbon metabolism in the intertidal fiddler crab *Uca pugnax*.** *Mar. Biol.* 36(1): 5-11; 1976. (24 references)

Fiddler crabs collected at oil-contaminated West Falmouth Salt Marsh and oil-free Sippewissett March on Buzzards Bay were analyzed for hydrocarbons. Cellular fractions from other fiddler crabs from the same locations were used to determine the rate of aldrin epoxidation to dieldrin *in vitro*, and a third group of fiddler crabs from these locations were placed in a 0.25 ppm 1-^{14}C-naphthalene seawater solution to determine the *in vivo* rate of naphthalene metabolism. *In vitro* studies using the nuclear supernatant of the claw-muscle fractions produced 59 pM dieldrin/mg protein/hr; the mitochondrial supernatant, 37 pM dieldrin/mg protein/hr; and the microsomes, 232 pM dieldrin/mg protein/hr. No dieldrin production by the microsomal supernatant was detected. Specific microsomal activity in various tissues ranged from 482 pM dieldrin produced/mg microsomal protein/hr in the green gland-eyestalk preparation to 96 pM dieldrin produced/mg microsomal protein/hr in the hepatopancreas. No differences in rates of aldrin epoxidation between crabs from the two areas were detectable. Bubbling the reaction mixture with carbon monoxide for 30 sec before adding the substrate reduced dieldrin formation to 52 pM dieldrin/mg microsomal protein/hr in claw-muscle microsomes. Bubbling with nitrogen did not significantly affect dieldrin formation. These results show that the mixed function oxidase system exists in fiddler crabs, is microsomal, requires NADPH, and is inhibited by carbon monoxide. Fiddler crabs from Sippewissett Marsh contained, at most, 11.8 ppm hydrocarbons by weight; those from West Falmouth Marsh contained 183 to 287 ppm. The amount of naphthalene metabolized increased linearly with the time Sippewissett crabs spent in the naphthalene solution until 48 hr, when all crabs were dead. West Falmouth crabs died within 24 hr.

78-0908. Das, B. ; Singh, P. K. (Blue-green Algae Lab., Cent. Rice Res. Inst., Cuttack 753006, Orissa, India) **Detoxication of the pesticide benzenehexachloride by blue-green algae.** *Microbios Lett.* 4(14): 99-102; 1977. (13 references)

A gradual loss of the toxic effect of BHC was studied in the blue-green algae *Anabaenopsis raciborskii* and *Anabaena aphanizomenoides*. The algae were grown in media containing 50, 60 or 80 μg/ml of lindane. Every third day, the algae were removed, and the media were inoculated with fresh cultures. No growth was detected for either alga at 80 μg/ml during the first two incubations. By the third incubation optical densities (OD) of 0.006 and 0.012 were observed for *Anabaenopis raciborskii* and *Anabaena aphanizomenoides*, respectively. In the 60 μg/ml media OD for the respective algae were noted at 0.009 and 0.011 during the second incubation and 0.015 and 0.018 during the third incubation. Growth of *A. raciborskii* after the first incubation at 50 μg/ml was 0.004 while *A. aphanizomenoides* was 0.005. The second incubation gave OD readings of 0.009 for *A. raciborskii* and 0.011 for *A. aphanizomenoides*. For the third incubation OD=0.022 for both. These results show that both algae had

a detoxicating effect on the medium by lowering the lindane concentration in the media.

78-0909. Pohlann, R. ; Werner, E.; Eschke, R. (Sekt. Tierprodukt. Veterinarmed., Humboldt. Univ. Berlin, Berlin, DDR) **Zur Problematik der Anwendung von insektoakariziden Karbamidsaeureestern in der Tierproduktion. 2. Mitt.: Akute Toxizitaet insektoakarizider Karbamidsaeureester. [Use of insectoacaricidal carbamic acid esters in livestock production. 2. Acute toxicity of insectoacaricidal carbamic acid esters.]** *Monatsh. Veterinaermed.* 31(4): 150-153; 1976. (31 references) (German)

The acute oral toxicity of carbaryl and propoxur was studied in sheep, rabbits and rats. No symptoms of poisoning were seen in sheep treated with carbaryl at a dose of 20 mg/kg. Loss of appetite and salivation were seen in sheep treated with 40 mg/kg 30 min after application. Doses of 80 and 160 mg/kg caused pronounced parasympathicomimetic symptoms, especially tachypnea (up to 240/min). The symptoms culminated 2.5 hr after administration. All doses caused significant, dose-dependent inhibition of the erythrocyte cholinesterase activity. Restlessness, unsteady gait, and muscular tremor were seen in rabbits and rats treated with carbaryl doses of 40 and 80 mg/kg respectively. Highly acute poisoning symptoms were seen in rats treated with 160 mg/kg and in rabbits treated with 80 mg/kg. Three of 5 rats treated with 320 mg/kg died. Propoxur caused no symptoms in rats and rabbits with respective doses of 2.5 and 5 mg/kg, but a dose of 10 mg/kg caused cholinergic effects, which was most pronounced in rats. A 40 mg/kg dose caused a mortality rate of 4/5 in rats. Considerable inhibition of the erythrocyte cholinesterase activity was also observed. Animals deprived of food for 16 hr prior to ingestion were considerably more susceptible to carbaryl and propoxur poisoning than were animals on normal diets. Atropine proved to be the best antidote to carbaryl and propoxur.

78-0910. Mallack, J. ; Joseph, S. R.; Menzer, R. E. (Maryland Dep. Agric., College Park, MD 20742) **Brain acetylcholinesterase levels in chickens and rabbits exposed to ground applications of ULV malathion.** *Mosq. News* 35(2): 185-188; 1975. (6 references)

Different groups of rabbits and chickens were exposed to each of the following malathion treatments: 5 passes by an ultra low volume (ULV) ground sprayer at 5 mi/hr at a discharge rate of 2.1 fl oz/min, 10 passes by the sprayer at 5 mi/hr at a discharge rate of 4.3 fl oz/min, and 20 passes by the sprayer at 5 mi/hr at a discharge rate of 4.3 oz/min, all at a distance of 50 ft from the animals. Other groups of rabbits and chickens were subjected to 5 and 15 min continuous exposure 30 ft from a stationary sprayer operating at a flow rate of 4.3 oz/min. Other rabbits received oral malathion doses of 1375 mg/kg, the acute oral LD50 for rats, or half that amount. Another group of chickens received oral malathion doses of 743 mg/kg or 371 mg/kg, half and one quarter of the LD50 for mallard ducks, respectively. Chickens exposed to malathion from a moving sprayer showed brain AChE inhibition levels of 0.7, 6.4, and 11.6% at the low, intermediate, and high levels of application, respectively. Five and 15 min continuous exposure of chickens resulted in brain AChE inhibition of 9.8% and 62.9%, respectively. No brain AChE inhibition was observed in rabbits exposed to the lowest flow rate from the moving sprayer. Rabbits exposed to the intermediate and high application levels showed brain AChE inhibition levels of 1.8% and 2.0%, respectively. Five and 15 min continuous exposure of rabbits resulted in brain AChE inhibition of 1.0% and 8.6%, respectively. These values were obtained 24 hr after exposure. Among animals continuously exposed for 5 min, maximum AChE inhibition in chickens occurred 3 days after treatment, and maximum AChE inhibition in rabbits occurred at the end of 24 hr. Chickens receiving oral doses of 1/2 LD50 and 1/4 LD50 showed enzyme inhibitions of 94.4 and 87.3%, respectively. Rabbits receiving oral doses of LD50 and 1/2 LD50 showed enzyme inhibitions of 79.2 and 49.6%, respectively. Only those animals receiving oral administrations displayed signs of organophosphate poisoning.

78-0911. Labrecque, G. C. ; Fye, R. L. (ARS, USDA, Gainesville, FL 32604) **Cytogenetic and other effects of the chemosterilants tepa, metepa, apholate and hempa in insects (a review).** *Mutat. Res.* 47(2): 99-113; 1978. (152 references)

A review of the literature revealed that the chemo - sterilants tepa (tris(1-aziridinyl) phosphine oxide), metepa (tri(2-methyl- 1-aziridinyl) phosphine oxide), apholate (2,2,-4,4,6,6-hexakis- (1-aziridinyl) -2,2,4,4,6,6-hexahydro- 1,3,5 2,4,6- triazatriphosphorine), and hempa (hexamethylmelamine) affected both reproductive and somatic tissues in over 65 species of insects. The effects were cytological, physiological, and genetic and varied from slight to severe. In some cases the deleterious effects may have been species-specific, but in general, they appeared to be dose-dependent. (Author abstract by permission)

78-0912. Schuepbach, M. ; Hummler, H. (Biol. Pharm. Dep., F. Hoffman La Roche Co. Ltd., Basel, Switzerland) **A comparative study on the mutagenicity of ethylenethiourea in bacterial and mammalian test systems.** *Mutat. Res.* 56(2): 111-120; 1977. (33 references)

The mutagenic effect of ethylenethiourea (ETU), a degradation product and metabolite of ethylenebisdithiocarbamates, which are widely used as fungicides, was studied in different test systems. ETU induced mutations of the base-pair substitution type in *Salmonella typhimurium* TA 1530 in vitro as well as in the host-mediated assay. In the host-mediated assay, a dose of 6000 mg/kg (LD50 = 5400 mg/kg) resulted in a slight < but significant increase of the reversion frequency by a factor of 2.37. The results of the micronucleus test were negative after two-fold oral applications of 700, 1850 and 6000 mg/kg to Swiss albino mice. Thus it is concluded that ETU hardly induces any chromosomal anomalism in the bone marrow. No dominant-lethal effect was observed after single oral doses of 500, 1000 and 3500 mg/kg given to male mice. (Author abstract by permission)

78-0913. Teramoto, S. ; Moriya, M.; Kato, K.; Tezuka, H.; Nakamura, S.; Shingu, A.; Shirasu, Y. (Toxicol. Div., Inst. Environ. Toxicol., Kodaira, Tokyo 187, Japan) **Mutagenicity testing on ethylenethiourea.** *Mutat. Res.* 56(2): 121-129; 1977. (18 references)

The potential mutagenicity of ethylenethiourea (ETU) was investigated by a series of experiments including microbial, cytogenetic and dominant-lethal studies. The microbial studies revealed a weak mutagenic activity of ETU for Salmonella strain TA1535. However, cytogenetic studies in Chinese hamster Don cells *in vitro* and bone-marrow cells of rats *in vivo* and the dominant-lethal studies in mice failed to reveal any mutagenicity-induced effect of ETU. (Author abstract by permission)

78-0914. Lamb, M. J. (Zool. Dep., Birkbeck Coll., London WC1E 7HX, England) **Mutagenicity tests with metrifonate in *Drosophila melanogaster.*** *Mutat. Res.* 56(2): 157-162; 1977. (10 references)

The organophosphorus insecticide metrifonate (*O,O* -dimethyl (1-hydroxy- 2,2,2-trichloroethyl) phosphonate), also known as trichlorfon or Dipterex, was tested for its ability to induce sex-linked and autosomal recessive lethal mutations in *Drosophila melanogaster.* There was no evidence of an increase in the frequency of lethal mutations after feeding adult males with metrifonate, but the high toxicity of the compound meant that only low concentrations could be used in this test system. (Author abstract by permission)

78-0915. Teramoto, S. ; Shingu, A.; Shirasu, Y. (Inst. Environ. Toxicol., Kodaira, Tokyo 187, Japan) **Induction of dominant-lethal mutations after administration of ethylenethiourea in combination with nitrite or of *N*-nitrosoethylenethiourea in mice.** *Mutat. Res.* 56(3): 335-340; 1978. (14 references)

Mutagenic potentials of ethylenethiourea (ETU) in combination with sodium nitrite or of *N*-nitroso-ETU, a nitrosation product of ETU *in vitro*, were investigated in the mouse dominant-lethal test. Simultaneous 5-day p.o. administration of ETU (150 mg/kg) and sodium nitrite (50 mg/kg) caused a significant decrease in the percentage pregnancy and the number of implants in weeks 5 and 6 of testing, although no effects were obtained on these indices when the chemicals were applied separately. However, in the group treated with 30 mg ETU plus 10 mg sodium nitrite per kg no dominant-lethal mutations were induced. 5-day oral administration of 100 mg of *N*-nitroso-ETU per kg also exhibited similar effects to those observed after treatment with 150 mg ETU plus 50 mg sodium nitrite per kg. (Author abstract by permission)

78-0916. Scott, B. R. ; Sparrow, A. H.; Schwemmer, S. S.; Schairer, L. A. (Univ. Texas Syst. Cancer Cent., M.D. Anderson Hosp. Tumor Inst., Smithville, TX 78957) **Plant metabolic activation of 1,2-dibromoethane (EDB) to a mutagen of greater potency.** *Mutat. Res.* 49(2): 203-212; 1978. (31 references)

The results presented in this paper suggest that EDB is capable of being converted to a mutagen by two reaction pathways, one involving a "breakdown" product in vitro and the other involving metabolic activation by plants. Associated with this study the methodology for *in vitro* qualitatively detecting promutagens which are converted by plant metabolism to active mutagens is described. (Author abstract by permission)

78-0917. Simonin, H. A. ; Skea, J. C. (New York State Dep. Environ. Conserv., Albany, NY) **Toxicity of diquat and cutrine to fingerling brown trout.** *N.Y. Fish Game J.* 24(1): 37-45; 1977. (11 references)

In static bioassay tests fingerling brown trout were placed in water containing various initial concentrations of Cutrine (chelated copper-ethanolamine) and diquat. Used alone, Cutrine had a 96-hr TLm of 0.198 mg/l copper. When fish were exposed to diquat alone, the percent survival decreased linearly as concentration increased. Survival was 75% after 48 hr exposure to 17.5 mg/l diquat and 25% after 48 hr exposure to 30.7 mg/l. Used alone, diquat had a 96-hr TLm of 20.4 mg of diquat cation/l. After 96 hr 5.5 mg/l diquat killed 5% of the fish, and 0.162 mg/l copper killed 30% of the fish. When these two concentrations were combined, all fish died within 24 hr. A synergism between the two pesticides is indicated. When a copper concentration of 0.162 mg/l was combined with diquat concentrations up to 5.5 mg/l, survival decreased linearly as diquat concentration increased. When 1.3 mg/l diquat was combined with the Cutrine, 60% of the fish survived after 24 hr and 50% of the fish survived after both 48 hr and 96 hr. When 4.1 mg/l diquat was combined with the Cutrine, there was a 10% fish survival rate after 24 hr and 5% of the fish survived after both 48 and 96 hr. The TLm for equal volumes of diquat and Cutrine was 0.51 and 0.191 mg/l active ingredient at 24 hr; 0.49 and 0.185 mg/l active ingredient at 48 hr; and 0.44 and 0.167 mg/l active ingredient at 96 hr, respectively.

78-0918. Sugimoto, T. ; Araki, F.; Taninaka, K. (Dep. Res., Nippon Noyaku Co. Ltd., Osaka, Japan) **[A new fungicide having insecticidal property, isoprothiolane. The versatile manifestation of its action, and its safety.]** *J. Pestic. Sci.* 2(spec. ed.): 505-513; 1977. (55 references) (Japanese)

Many reports have been published on the safety of isoprothiolane, diisopropyl 1,3-dithiolan- 2-ylidenemalonate, to mammals. Its acute toxicity is low. After a long-term feeding test no adverse effects were found except hepatic hypertrophy seemingly due to functional adaptation, and induction of hepato-enzymatic activity of metabolizing chemical compounds in the higher dose group. No effects on the reproduction capability or teratogenetic effects were recognized. It was found that isoprothiolane does not accumulate in plant bodies or in fishes. After feeding rats a diet containing 100 or 1000 ppm of isoprothiolane for one year, the content in the organs was in the range of 0.01-0.001 ppm. The metabolic route of isoprothiolane is discussed; oxidation of sulfur in dithiolane-ring, hydroxylation of C_4 in the same ring and hydrolysis of

isopropyl ester are being considered. The final metabolite is glyoxal disulfonic acid in plants, ethane disulfonic acid or isethionic acid in micro-organisms and carbon dioxide in mammals.

78-0919. Glukhova, L. G. (Dep. Pathol. Anat., Vinnitsa Med. Inst., Vinnitsa, USSR) **Morfologichni zmini v organikh potomstva shchuriv pri otruenni samok polikhlorpinenom. [Morphological changes in the organs of the progeny of female rats poisoned with polychloropinene.]** *Pediatr. Akush. Ginekol.* (6): 44-46; 1977. (Ukrainian)

Histological changes were studied in the progeny of albino rats treated with polychloropinene (single ig dose of 175 mg/kg during the first half of pregnancy, or 35 mg/kg doses during pregnancy and lactation). Some rats born to treated mothers were breast-fed by untreated mothers, and others born to untreated mothers were breast-fed by polychloropinene-treated mothers. Marked plethora, dilatation of the capillaries, and lymphoid-histiocytic infiltration were seen in the liver. Plethora, stasis and slight dystrophy of the epithelium of the convoluted tubuli were seen in the kidneys of the progeny. The spleen showed signs of plethora and hyperplasia of the lymphoid tissue. No histological changes were found in the heart, stomach, intestines or lungs. The findings are indicative of toxic effects of polychloropinene administered to pregnant and/or lactating rats on the progeny.

78-0920. Kearney, P. C. ; Isensee, A. R.; Kontson, A. (Agric. Environ. Qual. Inst., ARS, USDA, Beltsville, MD 20705) **Distribution and degradation of dinitroaniline herbicides in an aquatic ecosystem.** *Pestic. Biochem. Physiol.* 7: 242-248; 1977. (13 references)

Soil samples of 100 g containing bound butralin and profluralin residues were placed in 4 l aquariums, to which water and aquatic organisms were added. Other aquariums contained Matapeake loam mixed with 0.1 mg of butralin, chlornidine, dinitramine, fluchloralin, profluralin, or trifluralin along with water and aquatic organisms. Channel catfish and mosquito fish transferred from aquariums containing 10 ppb profluralin were later exposed to either 5 ppb profluralin added at 4 day intervals or transferred to new tanks containing 10 ppb at 4 day intervals. These aquariums were kept in total darkness. In the treated soil aquariums, fluchloran reached an equilibrium concentration of 14.8 ppb in water in about 10 days. Chlornidine reached a maximum between 15 ppb and 16 ppb in about 10 days, then decreased to 13.4 ppb at 30 days. Profluralin concentrations increased more slowly as the experiment progressed, reaching 5.7 ppb in 30 days. In ^{14}C-labeled herbicides, residues ranged from 4.79 ppm of fluchloralin in snails to 0.47 ppm of profluralin in daphnids. All parent herbicide compounds had been converted to other chemical forms. The ratio of the concentration in organisms to the concentration in water ranged from 32 for fluchloralin to 83 for dinitramine in fish kept for 3 days in aquariums exposed for 30 days to direct sunlight and from 235 for dinitramine to 755 for butralin in fish kept 3 days in aquariums maintained in darkness for 5 days. When the soil with bound residues was used, profluralin and butralin in the water increased to maxima of slightly over 15 and 20 ppb, respectively, at 13 days, then decreased to about 14 and 16 ppb, respectively, at 35 days. Residues in organisms kept in darkness ranged from 1.27 ppm for butralin in fish to 4.71 ppm for profluralin in daphnids. When mosquito fish were exposed to profluralin added at 4 day intervals, the bioaccumulation ratio increased to near 1200 in day 4, then decreased to about 300 at day 12. The profluralin concentration in the fish increased to 7 ppm on day 1, then decreased linearly to 2 ppm on day 12. In catfish, the bioaccumulation ratio increased steadily, reaching 11,000 and the profluralin concentration increased from 1.4 ppm on day 4 to 7.0 ppm on day 20.

78-0921. Schroeder, M. E. ; Shankland, D. L.; Hollingworth, R. M. (Dep. Entomol., Purdue Univ., W. Lafayette, IN 47907) **The effects of dieldrin and isomeric aldrin diols on synaptic transmission in the American cockroach and their relevance to the dieldrin poisoning syndrome.** *Pestic. Biochem. Physiol.* 7:403-415; 1977. (30 references)

The purpose of this study is to explore the mechanism of action of HEOD, which makes up 85% w/w of dieldrin, by determining the significance of the effects of aldrin diols on the central nervous system of the cockroach as they relate to the symptoms of HEOD poisoning. An approximate median lethal dose for injected doses of dieldrin was as 0.45 mg/kg. After injection at 115 mg/kg, the *trans* isomer of aldrindiol caused about 70%, and the *cis* isomer about 50% mortality. Injected doses of 40 mg/kg of the 3 compounds appeared in the ventral nerve cord to the extent of 0.13 - 0.26% of the doses. Dieldrin was more potent, but slower acting than the diols in causing synaptic after-discharge and elevated spontaneous activity in isolated nerve cords. The results are considered in relation to other studies which have been made on these compounds. It is concluded that in the American cockroach, dieldrin, rather than either of the diols, is the insecticidal agent in dieldrin poisoning, and that metabolic conversion of dieldrin to the *cis* and/or *trans* aldrindiol constitutes a detoxification.

78-0922. O'Brien, R. D. ; Herbert, T. J.; Hilton, B. D. (Sect. Neurobiol. Behav., Cornell Univ., Ithaca, NY 14853) **The effects of DDT upon flat and vesicular bilayers studied by a fluorescent probe.** *Pestic. Biochem. Physiol.* 7:416-425; 1977. (14 references)

The effect of DDT on the fluidity of flat phospholipid bilayers was explored using the new technique of fluorescence correlation spectroscopy. The fluorescent dye used was di(octadecyl)oxycarbocyanin. In flat bilayers of *torpedo* electroplax phospholipids, neither DDT nor its physiologically inactive analog, *p,p'*-hydroxy-DDT, affected the fluidity of the membrane. However DDT displaced half the dye from the membrane. In studies using lecithin or *Torpedo* electroplax phospholipid vesicles, using simple fluorescence measurements, no displacement of the dye was noted for either DDT or its analogs.

78-0923. Takeno, K. ; Nishimura, K.; Parmentier, J.; Narahashi, T. (Dep. Pharmacol., Med. Sch., Northwestern Univ., Chicago, IL 60611) **Insecticide screening with isolated nerve preparations for structure-activity relationships.** *Pestic. Biochem. Physiol.* 7:486-499; 1977. (13 references)

A comparison was made of the sciatic nerve sartorius muscle preparation from the frog, the nerve-muscle preparation from the crayfish, and the abdominal nerve cord preparation from the crayfish in relation to their sensitivity to various insecticides. The crayfish nerve cord was the most sensitive to insecticides and had a broad spectrum of sensitivity. A method was developed with this preparation to compare a large number of synthetic pyrethroids for their potencies to stimulate and block the nerve which is the primary target site. This preparation can be used to assess both stimulating and blocking actions on the nerve. Despite their weak nerve action, certain pyrethroids are active insecticidally. Some other pyrethroids are relatively moderate in killing insects despite their potent nerve action. Thus the new method can be effectively used to establish the true structure-activity relationship of synthetic pyrethroids or any other insecticides acting directly on the nerve.

78-0924. Yawetz, A. ; Agosin, M.; Perry, A. S. (Lab. Environ. Toxicol., Inst. Nat. Conserv. Res., Fac. Life Sci., George S. Wise Cent. Life Sci., Tel-Aviv Univ., Ramat-Aviv, Israel) **Components of the electron transport system in the microsomal mixed-function oxidase system in wild birds.** *Pestic. Biochem. Physiol.* 8(1): 44-52; 1978. (28 references)

Wild house sparrows, blackbirds, African bulbuls, starlings, rock partridges, and barn owls were trapped and sacrificed within 24 hr after capture. Cytochrome P-450 was estimated in microsomal suspensions centrifuged from the liver using the carbon monoxide difference spectrum. The CO difference spectrum of all species showed a maximum absorbance at 450 nm. The reduced vs oxidized difference spectrum of cytochrome b_5 showed a peak at 424 nm and a trough at 409 nm, both when the reduction was carried out with NADPH and when it was carried out with dithionite. The trough was shallower and the peak was higher when NADPH was used. Incubation systems containing 400-600 μg of microsomal protein and 30 μg of aldrin were used to determine aldrin epoxidase activity from the amount of dieldrin produced. Enzyme activity was linear between 5 and 15 min of incubation, when the reaction was stopped. The optimum pH was 7.5. The amount of protein and the amount of dieldrin formed were linearly proportional in the range of 200-800 μg of protein. Addition of 0.03 M ethyl isocyanide to microsomal suspensions produced a spectral change that differed in peak height and in the ratios of 430/455 nm peaks. The ratio was 4.5 in the barn owl, 2.2 in the blackbird, 2.9 in the house sparrow, and 3.2 in the African bulbul. The DDE residues in heart tissue ranged from 1.20 ppm in blackbirds to 0.37 ppm in African bulbuls. Residues of PCP's in heart tissue ranged from 0.77 ppm in blackbirds to 0.34 ppm in African bulbuls.

78-0925. Oswald, T. H. ; Smith, A. E.; Phillips, D. V. (Coll. Agric. Exp. Stn., Univ. Georgia, Experiment, GA 30212) **Phytotoxicity and detoxification of metribuzin in dark-grown suspension cultures of soybean.** *Pestic. Biochem. Physiol.* 8(1): 73-83; 1978. (17 references)

Callus from cotyledon tissue of the metribuzin resistant soybean cultivar "Bragg" and the susceptible cultivar "Coker 102" was grown on culture media under dark conditions. The cells were transferred to test solutions containing 1 μ*M* metribuzin to investigate detoxification of Metribuzin. Native extracts from resistant "Bragg" cultures fully protected the "Coker 102" cells from metribuzin. The fact that denatured extracts from resistant "Bragg" failed to provide protection indicated that protection was enzymatically determined. Denatured extracts from susceptible cultures significantly increased the herbicidal activity. "Coker 102" cells ere protected when native extracts from resistant cultures and extracts from susceptible cultures were used together. Added extract from susceptible cultures inhibited protection, and inhibition by denatured extracts was more acute. Native extracts contained detoxifying enzymes, which denaturation removed. Susceptible cultures produce an enzyme inhibitor. This inhibitor was heat-stable. Partial removal from the aqueous phase by solvent partitioning indicated that the inhibitor was a polar substance. Full protection in the presence of dialyzed extract showed that the molecular weight of the inhibitor was smaller than 6000-8000. Metribuzin was at least 99% recovered from test solutions prepared with denatured extracts and 94% to 95% recovered from solutions with native extracts of susceptible cultures. Less than half the initial amount of herbicide was recovered from solutions prepared with native extracts of resistant cultures, showing the elimination of herbicide to be an enzymatic process.

78-0926. Roberts, T. R. (Shell Biosci. Lab., Sittingbourne Res. Cent., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **The metabolism of the herbicide flamprop-methyl in wheat.** *Pestic. Sci.* 8(5): 463-472; 1977. (8 references)

The metabolism of the wild oat herbicide flamprop-methyl, methyl (±)-2-[*N*-(3-chloro-4- fluorophenyl)benzamido]propionate, in spring wheat grown to maturity has been studied under glasshouse and outdoor conditions. [^{14}C]-Flamprop-methyl labeled separately in the halophenyl ring and the carbonyl of the benzoyl group was used. The major metabolite formed in plants was the corresponding carboxylic acid, II, which also occurred as conjugates. Other minor metabolites, detected under glasshouse conditions only, were the 3- and 4-hydroxybenzoyl analogs of flamprop-methyl and 3′- chloro-4′- Fluorobenzanilide. The soil in which the plants were grown contained residues comprising mainly flamprop-methyl and II together with smaller amounts of unidentified polar material. (Author abstract by permission)

78-0927. Crawford, M. J. ; Hutson, D. H. (Shell Toxicol. Lab. Sittingbourne Res. Cent., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **The metabolism of the pyrethroid insecticide (±)-α-cyano -3- phenoxybenzyl 2, 2,3,3-tetramethyl cyclopropane carboxylate, WL 41706, in the rat.** *Pestic. Sci.* 8(6): 579-599; 1977. (11 references)

The metabolism of the pyrethroid insecticide α-cyano -3- phenoxybenzyl 2,2,3,3-tetramethylcyclopropanecarboxylate (WL 41706) has been studied in rats using two forms of ^{14}C-labelling (benzyl- and cyclopropyl-). Excretion of benzyl-^{14}C was rapid, 57% of the administered dose being eliminated in the urine 48 h after treatment and 40% in the feces. No significant sex difference was observed. The amount of radioactivity excreted via expired gases was 0.005% of the administered dose and less than 1.5% of the dose remained in the animals 8 days after treatment. The mean percentage recovery of administered dose was 104% for male rats and 97% for female rats. Urinary and fecal metabolites from these rats, and from rats dosed similarly with [cyclopropyl-^{14}C]-WL 41706 were studied. The rapid metabolism of WL 41706 is due to efficient cleavage of the ester bond by rats *in vivo* to afford 2,2,3,3-tetramethylcyclopropanecarboxylic acid (partly as glucuronide) and the 3-phenoxybenzyl moiety. Before this cleavage occurs, however, about half of the intake suffers aryl hydroxylation giving the α-cyano-3- (4-hydroxyphenoxy)benzyl ester, part of which is excreted in the bile as a conjugate(s) and part of which is cleaved and eliminated as the *O*-sulphate of 3-(4-hydroxyphenoxy)benzoic acid and the glucuronide of 2,2,3,3-tetramethylcyclopropanecarboxylic acid. A minor amount of hydroxylation occurs at a *trans*-methyl group on the cyclopropane acid moiety. The metabolism of WL 41706 by rat liver occurs mainly in the microsomes and mainly via oxidative processes. (Author abstract by permission)

78-0928. Schmidt, R. R. ; Fedtke, C. (Pflanzenschutz-Biol. Forsch. Bayer AG, D-5090 Leverkusen, Germany) **Metramitron activity in tolerant and susceptible plants.** *Pestic. Sci.* 8(6): 611-617; 1977. (10 references)

The herbicidal activity of metamitron, its inhibition of photosynthesis and its metabolism was studied in a number of plant species. An enzymic, light-independent deamination produces an inactive metabolite. Mebatolism is rapid in plants tolerant to metamitron, e.g. *Mercurialis annua* and particularly sugar beet (*Beta vulgaris* L), but slower in susceptible plants, e.g. *Amaranthus retroflexus.* (Author abstract by permission)

78-0929. van der Bercken, J. (Inst. Vet. Pharmacol. Toxicol., Univ. Utrecht, Utrecht, The Netherlands) **The action of allethrin on the peripheral nervous system of the frog.** *Pestic. Sci.* 8(6): 692-699; 1977. (16 references)

A study was made of the neurotoxic effects of the pyrethroid insecticide allethrin on the peripheral nervous system of the frog by means of electrophysiological techniques. The principal action of allethrin is to induce repetitive activity, not only in sensory nerve fibers and in sense organs, but also in the distal part of the motor fibers, leading to pronounced repetition in the motor end-plate. Measured by the number of repetitive nerve impulses allethrin shows a marked negative temperature coefficient of activity in the lateral-line sense organ and in the motor nerve terminal. (Author abstract by permission)

78-0930. Carlton, M. (Inst. Anim. Physiol., ARC, Babraham, Cambridge CB2 4AT, England) **Some effects of cismethrin on the rabbit nervous system.** *Pestic. Sci.* 8(6): 700-712; 1977. (11 references)

The effects of cismethrin, 5-benzyl-3- furylmethyl (1 *R*) -*cis*- chrysanthemate, in the spinal rabbit have been investigated at the level of the sensory receptors, in an afferent nerve, and in the spinal cord. Cismethrin causes a lowering of the threshold of some sensory receptors and the appearance of spontaneous activity, which may be in bursts, in some afferent fibres that were previously silent. When recordings were made from the afferent nerve, in addition to phenomena arising from the effects on sensory receptors, there was repetitive firing in the nerve when action potentials were evoked by electrical stimulation. The effects on the spinal cord were such as to increase the excitability of reflex arcs. There was also a change in the normal pattern of facilitation and inhibition as measured by the amplitude of the second of two suitably spaced monosynaptic responses and it is suggested that this is an indirect effect f cismethrin intoxication. The cumulative effect of the changes brough about in nervous activity in the system described here could account at least in part for the convulsions observed in intoxicated animals. (Author abstract by permission)

78-0931. Klaverkamp, J. F. ; Hodben, B. R.; Harrison, S. E. (Dep. Environ., Freshwater Inst., Winnipeg, Manitoba R3T 2N6, Canada) **Acute lethality and *in vitro* brain cholinesterase inhibition of acephate and fenitrothion in rainbow trout.** *Proc. West. Pharmacol. Soc.* 18: 358-361; 1975. (2 references)

The acute lethality and *in vitro* brain cholinesterase inhibition of acephate and fenitrothion were studied in rainbow trout. The 24 hr median lethal dose of acephate to rainbow trout at 15°C was approximately 975 mg/l, which is close to 240 times greater than 4 mg/l, the 24 hr median lethal dose of fenitrothion. The potency of acephate and fenitrothion for inhibiting brain cholinesterase was relatively low. The small difference in the pI-50 values of 0.9 and 1.1 for acephate and fenitrothion, respectively, does not explain the difference noted in acute lethality. Fenitrothion may undergo oxidative desulfurization to fenitrooxon, a very potent brain cholinesterase inhibitor. The differences in acute lethality between acephate and fenitrothion may be due to the ability of rainbow trout to convert fenitrothion to a more toxic metabolite.

78-0932. Aleksanyan, O. M. ; Kosinova, N. R.; Krilova, T. M. (Azov Sci. Res. Inst. Fish., Rostov-na-Donu, USSR) **Deystvie strontsiya-90 i metafosa na *Cyprinus carpio.* [Action of strontium-90 and metaphos on *Cyprinus carpio.*]** *Radiobiologiya* 18(1): 131-134; 1978. (10 references) (Russian)

The biological effects of 30 day exposure to metaphos (methyl parathion) (0.01 mg/liter), strontium-90 (1 μCurie/l) and their combination were studied in young *Cyprinus carpio.* The cumulation coeffienict of ^{90}Sr was reduced in the presence of metaphos (from 9.50 to 2.09 in the whole body,

and from 0.42 to 0.18 in the brain). Metaphos prevented the normalization of the reduced SH-group level and increased the peroxidase activity in the brain. Metaphos alone inhibited the acetylcholinesterase activity of the brain by 71% on the 5th day, and activity reached a normal level by the 30th day. The isotope had no additional influence on the acetylcholinesterase activity. The findings indicate that the combination of metaphos and ^{90}Sr exerted a less toxic effect on the fish than did the two separately, which is in agreement with reported data.

78-0933. Shimizu, T. ; Fukami, J. (Inst. Phys. Chem. Res., Wako-shi, Saitama 351, Japan) **Uptake and accumulation of ^{14}C-rotenone in carp.** *Radioisotopes* 27(1): 33-34; 1978. (5 references)

Carp were placed in glass tanks containing 0.013 and 0.25 ppm ^{14}C-rotenone. These concentrations were highly toxic, but not lethal. Radioactivity in the aquariums decreased about 30% in the first 2 days, then increased, reaching slightly over 50% of its original value at 20 days. Autoradiography was used to determine the distribution of rotenone in the fish. Rotenone was most concentrated in the gall bladder. TLC of crude extracts of fish bile detected 4 radioactive spots of rotenone and its metabolites.

78-0934. Hollinger, M. A. ; Giri, S. N. (Dep. Pharmacol., Sch. Med., Univ. California, Davis, CA 95616) **Binding of radioactivity from [^{14}C] paraquat to rat lung protein, *in vitro*.** *Res. Comm. Chem. Pathol. Pharmacol.* 19(2): 329-336; 1978. (15 references)

Tissue from mature male Sprague Dawley rats was exposed *in vitro* to various concentrations of ^{14}C-paraquat. In lung tissue incubated with labeled paraquat for 1 hr, binding of ^{14}C to protein increased slowly as paraquat concentration increased from 0.1 μM to 10 μM but was less than 1 pmole/mg protein. The concentration increased more rapidly, reaching 4.4 pmole/mg protein at 100 μM. The pattern of binding with time was essentially the same for 1 and 100 μM paraquat, although the amounts of binding were different. Most of the binding occurred within the first 30 min of incubation. Lung tissue retained the most label, followed by liver and heart tissues. Binding in spleen tissue was only slightly over 2 pmole/mg protein when incubated with 100 μM paraquat.

78-0935. Nikolayenko, Zh. I. ; Geller, I. A.; Sklyarenko, A. T. (All-Union Sci. Res. Sugar Beet Inst., Kiev, USSR) **Vliyanie ronita na pochvennuyu mikrofloru. [Effects of Ro-neet on soil microflora.]** *Sakh. Svekla* (12): 32-34; 1977. (Russian)

The effects of Ro-neet (cycloate) and its combinations with other herbicides on the soil microflora were studied in chernozem with a humus content of 3.2-3.5%. When applied at a dose of 2 kg/ha in the spring, Ro-neet had a low toxicity effect on most soil microorganisms, but was ineffective on fungi and denitrifying bacteria. Stimulation of soil microorganisms was seen at the end of the vegetation period. When applied in doses of 4 and 6 kg/ha, Ro-neet inhibited the growth of oligonitrophils, nitrogen-fixing bacteria, phosphorus bacteria, fungi, and *Clostridium pasteurianum*. The inhibiting effect decreased considerably in 2 mo. The combinations of Ro-neet (4 kg/ha) with pyramine, lenacil, eptam and TCA exerted similar but less marked inhibiting effects than higher doses of Ro-neet alone.

78-0936. Bigler, U. ; Muller, J. (Stoffwechselabt.,Dep. Inn. Med., Univ. Zurich, CH-8091 Zurich, Switzerland) **Mehrfaches Rezidiv eines Cushing-Syndroms nach bilateraler Adrenalektomie und Hypophyseneingriffen. Heilung mit *o,p'*-DDD. [Multiple recurrence of Cushing's syndrome after bilateral adrenalectomy and interventions on the pituitary gland. Cure by treatment with *o,p'*-DDD.]** *Schweiz. Med. Wochenschr.* 108(2): 67-72; 1978. (41 references) (German)

A 26-yr-old woman has had multiple recurrences of Cushing's syndrome in spite of chemotherapy, irradiation of the pituitary gland, removal of a malignant pituitary adenoma and adrenalectomy. Therapy with *o,p'*-DDD was initiated 11 yr after onset of the disease. The initial dose of 1 g/day po was increased to 3 g/day in a few mo, and the reduced to 2 g/day. Shen began losing weight after 3 mo treatment, and complete but temporary normalization of the biochemical parameters was achieved after treatment for about 1.5 yr. Side-effects (nausea and diarrhea) were seen only during treatment with the 3 g/day dose.

78-0937. Skalsky, H. L. ; Guthrie, F. E. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607) **Binding of insecticides to human serum proteins.** *Toxicol. Appl. Pharmacol.* 43(2): 229-235; 1978. (19 references)

This investigation concerns the binding of DDT, dieldrin, carbaryl, and parathion to human serum proteins. Fresh human serum and commercially prepared human blood fractions were used to investigate the binding characteristics of the insecticides. Binding was demonstrated to be of a low affinity, hydrophobic nature with the albumin and lipoprotein fractions exhibiting the highest affinity for the insecticides. The binding of DDT and dieldrin to the lipoproteins was inferred to be partially protective in acute poisoning because of the relative stability of the protein-pesticide complex. All the protein fractions examined can clearly play some role in the transport of these insecticides. (Author abstract by permission)

78-0938. Omaye, S. T. ; Reddy, K. A.; Cross, C. E. (Div. Biochem., Letterman Army Inst. Res., San Francisco, CA 94129) **Enhanced lung toxicity of paraquat in selenium-deficient rats.** *Toxicol. Appl. Pharmacol.* 43(2): 237-247; 1978. (50 references)

In an attempt to further clarify the mechanisms of paraquat lung injury, paraquat toxicity was studied in selenium (Se)-deficient rats. Chronic respiratory disease-free rats fed a basal Se-deficient diet or a basal diet supplemented with 0.5 or 2.0 ppm of Se for 40 days after weaning were injected

with 25 mg/kg of paraquat dichloride (ip). Within 4 hr after paraquat injection, 50% of the rats fed the Se-deficeint regimen died, exhibiting neurological and respiratory signs of distress prior to death, whereas all rats fed Se-supplemented diets survived for this short time span. Excised lungs from surviving Se-deficient rats injected with paraquat showed extensive lung damage, as evidenced by gross examination, increased lung weights, and increases in cystosolic lung lysosomal enzymes, and exhibited a significant increase of thiobarbituric acid (TBA)-reactive products. Excised lungs from Se-supplemented rats failed to show similar increases in these indices of paraquat-induced lung injury. Our data confirms and extends previous findings of others that paraquat toxicity is enhanced in Se-deficient animals and suggests that lipid peroxide formations may play a role in the enhanced susceptibility. (Author abstract by permission)

78-0939. Akin, F. J. ; Norred, W. P. (Richard B. Russell Agric. Res. Cent., Pharmacol. Res. Lab., ARS, USDA, Athens, GA 30604) **Effects of short-term administration of maleic hydrazide or hydrazine on rat hepatic microsomal enzymes.** *Toxicol. Appl. Pharmacol.* 43(2): 287-292; 1978. (26 references)

The herbicide maleic hydrazide (MH), in amounts greatly exceeding its residue level in foods, had no apparent effect on the hepatic microsomal enzyme system of Fischer rats. *In vivo*, up to 1 g/kg of MH did not affect hexobarbital sleep times (HST) and *in vitro*, 2 g/kg of the sodium salt of MH altered neither the metabolism of benzo(a)pyrene and aniline nor the activities of cytochromes *b*, and P-450. Hydrazine-SO_4, a frequent contaminant of commercial MH preparations, in moderately high doses prolonged HST and diversely altered metabolism *in vitro*. The effects of hydrazine impurities, if present, could be significant in toxicity tests where excessive doses of MH are administered. (Author abstract by permission)

78-0940. Addison, R. F. ; Willis, D. E. (Dep. Fish. Environ., Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, N. S. B2Y 4A2, Canada) **The metabolism by rainbow trout (*Slamo gairdnerii*) of *p,p'*- (^{14}C)DDT and some of its possible degradation products labeled with ^{14}C.** *Toxicol. Appl. Pharmacol.* 43(2): 303-315; 1978. (31 references)

Groups of 5 or 10 Rainbow trout fry (*Salmo gairdnerii*) weighing around 1 g were injected im with ^{14}C-labeled 2,2-bis (*p*-chlorophenyl)- 1,1,1- trichloroethane (*p,p'*-DDT); 2,2bis (*p*-chlorophenyl)- 1,1,- dichloroethylene (*p,p'*-DDE); 2,2-bis (*p*-chlorophenyl)- 1,1- dichloroethane (*p,p'*-DDD); 2,-2-bis (*p*-chlorophenyl)-1- chloroethane (*p,p'*-DDMS); 1,1-bis (*p*-chlorophenyl)ethylene (*p,p'*-DDNU); 2,2-bis(*p*-chlorophenyl) -1- chloroethylene (*p,p'*-DDMU); 2,2-bis (*p*-chlorophenyl) ethanol (*p,p'*-DDOH); *p*-dichloro benzophenone (*p,p'*-DBP); *p*-dichloro benzhydrol (*p,p'*-DBH); or bis (*p*-chlorophenyl) acetic acid (*p,p'*-DDA). At intervals of 24 hr and 3 wk after injection (except in the case of the *p,p'*-[^{14}C]DDOH and *p,p'*-[^{14}C]DDA injected groups, where only 24 hr samples were taken), the fish were killed, extracted individually, and analyzed for *p,p'*-DDT metabolites. Their water was also analyzed 24 hr after injection. *p,p'*-[^{14}C]DDD was converted to a limited extent to *p,p'*-DDMU, and *p,p'*-[^{14}C]DDMS was similarly dehydrochlorinated to *p,p'*-DDNU. *p,p'*-[^{14}C]DBH and *p,p'*-[^{14}C]DBP were interconverted to some extent, and *p,p'*-[^{14}C]DDA was converted to *p,p'*-DBP. *p,p'*-[^{14}C]DDOH, was apparently converted to *p,p'*-DBP in one experiment, but a second exposure did not confirm this. None of the dehydrochlorination products (*p,p'*-[^{14}C]DDE, *p,p'*-[^{14}C]DDMU, and *p,p'*-[^{14}C]DDNU) was degraded and *p,p'*-DDMU therefore appears to be one of the end products of DDT metabolism by trout. (Author abstract by permission)

78-0941. Kaminsky, L. S. ; Piper, L. J.; McMartin, D. N.; Fasco, M. J. (Div. Lab. Res., New York State Dep. Health, Albany, NY 12201) **Induction of hepatic microsomal cytochrome P-450 by mirex and Kepone.** *Toxicol. Appl. Pharmacol.* 43(2): 327-338; 1978. (34 references)

The chlorinated insecticides, mirex and Kepone, pose a threat to human health as a consequence of their pollution of the environment. We investigated their potential to affect synergistically the toxicity of other xenobiotics and the pharmacological function of drugs by induction of hepatic microsomal enzymes. Male rats were induced by ip injection of mirex (50 or 5 mg/kg/day for 5 days) or Kepone (10 or 1 mg/kg/day for 5 days). Metabolic activity was tested with warfarin and biphenyl using high performance liquid chromatographic assays. The high doses of both compounds induced cytochrome P-450 with absorbance bands (reduced, CO complex) at 449 nm. Cytochrome concentrations were enhanced 2-fold relative to controls. Mirex resembled 3-methylcholanthrene and benzo(a)pyrene by inducing formation of 6-hydroxywarfarin but differed in not inducing 8-hydroxywarfarin. Kepone resembled phenobarbital in inducing 7-hydroxywarfarin but differed in its effects on the other metabolites. The low dose of mirex induced higher amounts of 4'-hydroxywarfarin than did the high dose. The metabolite profiles with high and low doses of Kepone also showed marked variations from one another. Mirex and Kepone are carcinogenic in rats and mice but, in contrast to the polycyclic aromatic carcinogens, do not markedly enhance the activity of microsomal biphenyl 2-hydroxylase relative to biphenyl 4-hydroxylase. We conclude that mirex and Kepone induce hepatic mixed-function oxidase profiles which differ from one another and from the classical inducers, phenobarbital and 3-methylcholanthrene. Mirex apparently only induces one of the enzymes induced by 3-methylcholanthrene. The enzyme profiles arising from the insecticides are dose dependent and will thus potentiate qualitatively differing effects depending on the level of ingestion. (Author abstract by permission)

78-0942. Blecher, H. ; Blecher, R.; Mueller, R.; Lingens, F. (Inst. Mikrobiol., Univ. Hohenheim, D-7000 Stuttgart 70, Germany) **Isolierung und Charakterisierung Antipyrinabbauender Bakterien. [Isolation and characterization of an-**

tipyrine-degrading bacteria.] *Z. Naturforsch. Teil C* 33(1-2): 120-123; 1978. (10 references) (German)

Five strains of soil bacteria using antipyrine as a sole carbon source were isolated. Morphological and physiological examinations indicated these strains to be closely related to those isolated with chlordazon, a herbicide. Some of the strains selectively grown on antipyrine can also be grown on chloridazon. Resting cells of the strains which cannot be grown on chloridazon can convert chloridazon to its catechol derivative, 5-amino- 4-chloro- 2(2,3-dihydroxyphenyl) - 3(2H)- pyridazinone. The catechol 2,3-dioxygenase, which catalyzes the cleavage of the catechol derivative of antipyrine in these bacteria, is only slightly active with the catechol derivative of chloridazon.

78-0943. Kunz, T. H. ; Anthony, E. L. P.; Rumage, W. T., III (Dep. Biol., Boston Univ., Boston, MA 02215) **Mortality of little brown bats following multiple pesticide applications.** *J. Wildl. Manage.* 41(3): 476-483; 1977. (30 references)

This study documents the mortality of little brown bats (*Myotis lucifugus*) at a nursery colony in southern New Hampshire in a 2 yr period following multiple applications of pesticides (DDT, chlordane) for extermination. Mortality among adult females was greatest in the second summer (principally in the parturition period) following the last pesticide application. Two major peaks of mortality occurred in young bats, one soon after birth and another as they reached adult size. Significant age differences in mortality were observed between the first and second yr after spraying. The percentage of young bats dying as they approached adult size was highest in the second yr. Mortality was nearly 9 times higher in young than among adult bats in the first yr, whereas proportionately more adults died in the second yr. We suggest that the prolonged and latent mortality of bats following pesticide applications increases the short and long term health risk to humans and therefore necessitates the reevaluation of current extermination practices. (Author abstract by permission)

See also 78-0723, 78-0764, 78-0765, 78-0784, 78-0793, 78-0795, 78-0800, 78-0808, *and* 78-0813.

78-0944. Makeeva-Guryanova, L. T. ; Spiridonova, Y. Y.; Klimenko, A. A. (All-Union Sci. Res. Inst. Phytopathol., Bol'shie Viazemy, Moscow USSR) **Kolorimetricheskii metod opredeleniia gerbitsida piklorama v pochve. [Colorimetric determination of the herbicide picloram in the soil.]** *Agrokhimiya* (8): 142-147; 1975. (15 references) (Russian)

A colorimetric method for the quantitative determination of picloram in soil is described. Following extraction with potassium chloride the suspended particles are separated by centrifugation at 5,000 x *g*, the supernatant is filtered, the filtrate is acidified to pH 2 with sulfuric acid, and 4-amino-3,5,6-trichloropicolinic acid is extracted with sulfur ether. The solvent is evaporated, the residue is dissolved in potassium hydroxide, and picloram is diazotized with sodium nitrite in 4 *N*-sulfuric acid. The diazotized product is determined colorimetrically by measuring its extinction at 405 nm in a 10 mm cuvette in a spectrophotometer against distilled water. The color of the solution is stable for 6 hr. The sensitivity of the method amounts to 0.5 mg/kg at an error of 2-8%. The recovery rate is 65-95%, depending on the soil.

78-0945. Aue, W. A. ; Kapila, S. (Dalhousie Univ., Halifax, N.S., Canada) **Use of electron capture-induced products for confirmation of identity in pesticide residue analysis.** *Anal. Chem.* 50(3): 536-538; 1978. (4 references)

The products of reactions in the electron capture detector (ECD) can sometimes react with electrons themselves. Some pesticides produce distinct product patterns that could be used to identify the pesticide. Electron capture can be used as a derivatization reaction on a single chromatographic peak. The apparatus includes a chromatographic column whose effluents are normally shunted through a dummy column to an exhaust duct but are directed to another chromatographic column with an ECD at the peak of interest. Chromatograms were obtained with an ECD after the first column for PCNB, Aroclor 1254, and a mixture of the two. In the chromatograms of the mixture, the second run gave distinctive separation of the two pesticides, while the first column showed poor resolution. This was due to the temperature difference between the two columns and better chromatographic conditions for the second column.

78-0946. Smyth, M. R. ; Osteryoung, J. G. (Dep. Microbiol., Colorado State Univ., Fort Collins, CO 80523) **A pulse polarographic investigation of parathion and some other nitro-containing pesticides.** *Anal. Chim. Acta* 96(2): 335-344; 1978. (15 references)

The polarographic behavior of parathion, it major metabolites (paraoxon and *p*-nitrophenol), and of methylparathion, EPN and pentachloronitrobenzene has been studied over a wide pH range. Differential pulse polarography is used to differentiate between parathion, *p*-nitrophenol and pentachloronitrobenzene. An indirect determination of parathion in the presence of paraoxon can be based on their respective rates of hydrolysis in 0.5 M sodium hydroxide solution. The electrochemical behavior of these compounds has also been investigated in solutions containing tetraaklyammonium salts as the supporting electrolyte. (Author abstract by permission)

78-0947. Thompson, J. F. ; Reid, S. J.; Kantor, E. J. (Environ. Toxicol. Div., Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **A multiclass, multiresidue analytical method for pesticides in water.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 143-157; 1977. (20 references)

A procedure is reported for the multiclass, multiresidue analysis of pesticides in water. Compounds are extracted from water with methylene chloride, and the extract is concentrated by an evaporative technique utilizing reduced pressure and low temperature. Compounds are segregated into groups using a column of partially deactivated silica gel and sequential elution with four different solvent systems. Carbamate residues, converted to their 2,4-dinitrophenyl ether derivatives, are gas chromatographed *via* electron capture detection as are the parent compounds of the organohalogen compounds. Organophosphorus compounds are determined by gas chromatography using a flame photometric detector. Recovery studies were conducted on 42 halogenated compounds, 38 organophosphorus compounds, and 7 carbamates. Fifty-eight of 87 compounds tested produced recoveries in excess of 80%; another 13 compounds yielded recoveries exceeding 60%, while the recoveries on the remaining 16 compounds fell below 60%. (Author abstract by permission)

78-0948. Moseman, R. F. ; Crist, H. L.; Edgerton, T. R.; Ward, M. K. (Health Effects Res. Lab., Environ. Res. Cent., US EPA, Research Triangle Park, NC 27711) **Electron capture gas chromatographic determination of Kepone residues in environmental samples.** *Arch. Environ. Contam. Toxicol.* 6(2-3): 221-231; 1977. (10 references)

The pollution of the environment with Kepone (chlordecone, decachlorooctahydro- 1,3,4-metheno-2*H*-cyclobuta [*cd*]pentalen -2- one) by an industrial manufacturer of the pesticide resulted in the contamination of several terrestrial media, including biological life, near the entry of the insecticide into the ecosystem. The substrata investigated and for which residue methodology was developed included river sediment, soil, water, shellfish, and finfish. Rigorous extraction techniques utilizing the Soxhlet apparatus and the Polytron tissue homogenizer were required for complete removal of Kepone from the samples. Finfish tissue was the most difficult to analyze. For this type of substratum, a preliminary cleanup by gel permeation chromatography was required to remove most of the lipid material followed by a micro Florisil column elution to eliminate polychlorinated biphenyls (PCB's). Cleanup of shellfish and other environmental samples was accomplished with a micro Florisil column only. Electron capture gas chromatography was used to analyze the sample extracts. Recoveries of Kepone from fortified samples averaged 84% or greater. (Author abstract by permission)

78-0949. Gelbke, H. P. ; Grell, T. H.; Schmidt, Gg. (Inst. Rechtsmed., Univ. Heidelberg, D-6900 Heidelberg, Germany) **Isolation of drugs from blood by column chromatography on Amberlite XAD-2.** *Arch. Toxicol.* 39(3): 211-217; 1978. (30 references)

An investigation was carried out on the isolation of 28 drugs from blood by column chromatography on Amberlite XAD-2. The following substances were added to postmortem blood specimens, at concentrations generally of 1-10 μg/ml: barbital, heptabarbital, hexobarbital, pentobarbital, phenobarbital, phenylbutazone, monocrotophos, amidopyrine, carbromal, diazepam, meprobamate, methaqualone, nitrazepam, phenazetim, chlorpromazine, dibenzepin, diphenhydramine, haloperidol, imipramine, mescaline, methadone, morphine, pentazocine, pethidine, tilidine, triflupromazine, verapamil, N-propylajmalinium bitartrate. The samples were purified by column chromatography on Amberlite XAD-2 and simple solvent extraction and subsequently quantitated by gas chromatography. By systematic variation of the conditions for adsorption of the drugs and desorption from the resin, recoveries of more than 80% after XAD-2 column chromatography could be achieved for most drugs. Thereby it was demonstrated that in cases of fatal poisoning or emergencies this procedure is a valuable tool for forensic and clinical toxicologists who have to find out the toxic agent by chemical analysis of the blood. (Author abstact by permission)

78-0950. Banelli, G. (Lab. Chim. Prov., Arezzo, Italy) **Analisi gaschromatografica di residui di triazine con detector termionico a bromuro di rubidio. [Gas chromatographic analysis of triazine residues with a rubidium bromide thermionic detector.]** *Boll. Lab. Chim. Prov.* 25(1): 17-27; 1974. (7 references) (Italian)

Gas chromatographic determination of atrazine, simazine, ametryne, GS 13589 and GS 14254 by means of a rubidium bromide thermionic detector is described. A column with UCC on silanized Chromosorb W-HP, helium as the carrier gas, and injector, column and detector temperatures of 210, 190 and 270°C, respectively, were used. The retention times were found to be 2.4 min for atrazine and simazine, 2.7 min for GS 13589, 3.1 min for GS 14254, and 3.9 min for ametryne. Acetonitrile was used to extract atrazine from soil, and chloroform was used for extraction from forage. The analysis of soil and forage samples with known amounts of atrazine added revealed that the recovery rate is 80-92%.

78-0951. Rouchaud, J. P. (Phytopathol. Lab., Univ. Cathol. Louvain, B-1348 Louvain, Belgium) **Analysis of piperazine, of the piperazine generating fungicide triforine, and of triforine's metabolites in barley plants.** *Bull. Environ. Contam. Toxicol.* 18(2): 184-189; 1977. (7 references)

A procedure was developed to measure the total amount of compounds containing the piperazine ring in barley plants treated with the fungicide triforine. A 100 g sample of straw or grains is homogenized with chloroform, centrifuged, and filtered. The extract is extracted again with aqueous 0.1 *N* HCl. The extract formed is filtered and concentrated to form Concentrate A. The 0.1 *N* HCl extract is brought to pH 4 with aqueous NaOH and freeze-dried, yielding Concentrate B. Part of Concentrate A is evaporated to dryness. Eighty ml of 10% sulfuric acid are added, and the mixture is distilled into a receiving flask containing 10 ml of distilled water. This distillate is mixed with NaCl and ethyl formate. The chloral content of this solution is measured by gas liquid chromatography (GLC). Two moles of chloral correspond to one of the compound containing the piperazine ring. Part of Concentrate B is dissolved and freeze-dried. The residue is shaken with aqueous NaOH and chloroform. The cloroform phase is analyzed by GLC for piperazine. One mole of a compound containing the piperazine ring corresponds to one mole of piperazine. The solid residue from extraction is heated with 80 ml aqueous 4 *N* HCl, centrifuged, brought to pH 4 with NaOH, and freeze-dried. The residue is analyzed in the same way as for Concentrate B. The three results are added to give the total amount of compounds containing the piperazine ring. After preparative thin layer chromatography (PTLC) of part of Concentrate A, the band corresponding to triforine is removed, hydrolyzed in sulfuric acid, and analyzed for chloral by GLC to determine triforine. After part of Concentrate B is shaken with a mixture of aqueous NaOH and chloroform, an aliquot of the chloroform phase is anlayzed for piperazine. The rest is subjected to PTLC, and the band corresponding to TF/2 is removed, hydrolyzed in sulfuric acid, and GLC-analyzed for chloral; one mole of chloral corresponds to one mole of TF/2. When samples were spiked with 0.05 ppm of the compound being analyzed, 82-103% of the triforine, 78-102% of TF/2, and 77-95% of the piperazine were recovered from straw. When grains were similarly spiked, 88-104% of the triforine 81-95% of TF/2 and 74-93% of the piperazine were recovered.

78-0952. Syoyama, M. ; Miyachi, Y.; Sakakibara, J. (Criminol. Lab., Police Headquarters, Nagoya, Japan) **[Gas chromatographic determination of bis-(*p*-chlorophenyl) carbinol acaricides.]** *Bunseki Kagaku* 24(8): 511-515; 1975. (5 references) (Japanese)

A modified gas chromatographic method was developed for detecting the acaricides chlorfenethol, chlorobenzilate, and chloropropylate. Trifluoroacetic anhydride (TFAA) quickly and quantitatively esterifies the tertiary hydroxyl group present in each. The esters have a shorter retention time and more symmetric peaks than the parent substances in gas chromatography. Twenty to 50 μl of TFAA and 10 to 500 μl of pyridine completely esterified 5 mg of original substances. Tetrahydrofuran was a suitable reaction solvent. The calibration curve of anthracene, an internal standard, was linear at weight ratios of 0.2 to 2. The coefficients of variance were 3% for chlorfenethol, 3.5% for chlorobenzilate, and 3.2% for chloropropylate. After adding anhydrous Na_2SO_4, acetone was used to extract acaricides from miso-soup, milk, fermented milk and triturated liver, to which 50 ppm acaricide had been added. After the acetone was evaporated, the residual liquid was extracted with hexane. Hexane-

acetonitrile distribution and TLC separated the extracts from other impurities. The method recovered 60-73% for chlorfenethol, 71-78% for chlorobenzilate, and 73-80% for chloropropylate.

78-0953. Sattar, M. A. ; Hattula, M.-L.; Lahtipera, M.; Paasivirta, J. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Improved analysis method of MCPA from soil samples.** *Chemosphere* (11): 747-751; 1977. (15 references)

Different methods of sample cleanup are described with the analysis method. Five grams of sandy or clay soil were mixed with 200 μl or 500 μl of 0.1% solution of MCPA in ml water and 1-2 g anhydrous sodium sulfate. Extraction was done either by Soxhlet extraction or by shaking with ether, ether-chloroform adjusted to pH 3, or ether-acetone-hexane-heptane. Two hundred or 400 μl of each soil extract were shaken in a centrifuge tube with pentafluorobenzyl bromide, potassium carbonate solution, and acetone. After 3 hr *n*-heptane was added, and the solution was evaporated and transferred with ether to make 10 ml. Fifty, 100, or 200 μl of this solution were evaporated, then mixed with 3 ml water and 10 ml toluene. After separting the layers, the toluene layer was dried. Other samples of each crude derivative solution were cleaned up by TLC. In column cleanup, 50, 100, or 200 μl of each crude derivative solution were evaporated and dissolved in 5 ml hexane. Determinations were made by gas chromatography. Recoveries from sandy soil ranged from 66.42% with diethyl ether as the extraction solvent followed by shaking and column cleanup to 88.15% with ether-acetone- hexane-heptane as the extraction solvent followed by shaking, extraction and cleanup by water/toluene shaking. The latter method also gave the highest recovery, 94.70%, from clay soil. The lowest recovery from clay soil, 69.90%, was obtained with diethyl ether as the extraction solvent, Soxhlet extraction, and water/toluene shaking.

78-0954. Stijve, T. (Control Lab., Nestle Prod. Tech. Assist. Co. Ltd., La Tour-de-Peilz, Switzerland) **Improved method for the gas chromatographic determination of inorganic bromide residues in foodstuffs fumigated with methyl bromide.** *Dtsch. Lebensm. Rundsch.* 73(10): 321-325; 1977. (13 references)

In an improved method for determining inorganic bromide residues in foodstuffs fumigated with methyl bromide, derivatization is carried out with ethylene oxide in an aqueous sulfuric acid sample slurry, followed by extraction of ethylene bromohydrin with ethyl acetate. The extract was analyzed by gas chromatography with an electron capture detector. Recoveries of inorganic bromide added to food products at levels of 5 to 500 ppm ranged from 82% to 120%. The method was used to analyze numerous samples of food products. Before fumigation none of the dehydrated vegetables sampled contained more than 100 mg/kg bromide; after fumigation some samples of dehydrated green leeks, tomato flakes, parsley, and mixed vegetables exceeded this level. Half of the cereal and cereal product samples known to have been harvested after fumigation exceeded the recommended maximum of 50 ppm bromide. Some of these levels could be attributed to unsatisfactory fumigation practices. The highest bromide concentration, 1550 mg/kg, was found in a sample of fumigated powdered mushrooms, *Boletus edulis*.

78-0955. Hild, J. ; Thier, H.-P. (Inst. Lebensmittelchem., Univ. Munster, Munster, Germany) **Aufarbeitung von Pflanzenmaterial zur schnellen Rueckstandsanalyse lipoid- und wasserloeslicher Organophosphor-Pestizide. [Processing plant material for rapid analysis of liposoluble and water-soluble organophosphorus pesticide residues.]** *Dtsch. Lebensm. Rundsch.* 73(10): 330-332; 1977. (6 references) (German)

A method for the extraction and gas chromatographic determination of residues of liposoluble and water-soluble organophosphorus pesticides in plant materials is described. The residues are extracted from the homogenized sample with acetonitrile. The coextracted water is separated by the addition of dichloromethane, the remaining organic phase is concentrated to dryness, and the residue, dissolved in dichloromethane, is determined by gas chromatography with alkali-FID. The recovery rates determined for a residue level of 0.1 mg/kg in carrots and spinach range from 52 to 104% for various organophosphorus pesticides.

78-0956. Goeke, G. (Chem. Untersuchungsamt Hagen, Hagen, Germany) **Rationelle Pestizid-Rueckstandsanalysen von tierischen Lebensmitteln durch Sweep-Co-Destillation und GC-Datenverarbeitung. [Systematic pesticide residue analysis in foods of animal origin by sweep codistillation and GC data-processing.]** *Dtsch. Lebensm. Rundsch.* 71(9): 309-314; 1975. (15 references) (German)

Sweep-codistillation of fatty raw extracts, followed by GC data processing, can be used in analyzing pesticide residues in animal foodstuffs. Less solvent is required than for normal clean-up. Experiences with the sweep-codistiller and possibilities for improving the equipment are reported. Only methoxychlor, of the 17 chlorinated hydrocarbons studied, gave a recovery rate of less than 80%. Some of the recovery rates were better than 90%. Amounts of *p,p'*-DDT as large as 10% were converted to TDE in the Storherr column. This effect did not always occur, and the reason for it has not been determined.

78-0957. Hass, J. R. ; Friesen, M. D.; Parker, C. E.; Harvan, D. J. (Environ. Biol. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Use of negative-ion chemical ionization mass spectrometry in the determination of polychlorodibenzo- *p*-dioxins at the part-per-trillion level in tissue samples.** *Environ. Health Perspect.* 20:246; 1977.

Current methods for analysis of polychlorodibenzo-*p*-dioxins (PCDD) at the ppt level involve extensive sample extraction and clean-up followed by measurement of the PCDD using a relatively high performance mass spectrometer. A more rapid extraction and clean-up method in combi-

nation with PCDD measurement by gas chromatography negative ion chemical ionization mass spectrometry (NICI) is described. The gas chromatographic column injected with 0.1 to 1 ng of material can be detected using a quadrupole mass spectrometer modified for negative ion detection. Dairy cow livers and fat from animals housed in a building constructed of pentachlorphenol treated lumber were analyzed and contained 10 ppt hexaCDD, 50 ppb octaCDD, and intermediate values of heptaCDD. The NICI method agreed quite well with electron impact mass spectrometry when PCDD levels were sufficiently high for comparison. The NICI method gave a linear response between 10 pg and 10 ng PCDD injected on the gas chromatographic column.

78-0958. Albro, P. W. ; Chae, K.; Luster, M.; McKinney, J. D.; Chaudhary, S.; Clark, G.; Fawkes, J.; Corbett, J. (Environ. Biol. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Radioimmunoassay for 2,3,7,8- tetrachlorodibenzo- *p*-dioxin.** *Environ. Health Perspect.* 20: 247; 1977.

Antibodies against 1-amino-3,7,8- dibenzo-*p*-dioxin coupled to either bovine thyroglobulin, bovine serum albumin, or human serum albumin. The 11 rabbits immunized produced usable antisera. Titers exceeded 1:32 on Ouchterlony plates, and antisera could be diluted at 1:3200 for use in radio immunoassays. Tetrachlorobiphenyls, dibenzofuran, chlorobiphenyl ethers, and chloranilines, whose quantities exceeded the dioxin by 10^3 to 10^4 fold, did not interfere. A nonionic detergent was utilized to accomodate dibenzodioxin, which is extremely insoluble, in the system. The assay responds to quantities of free 2,3,7,8-tetrachlorodibenzo- *p* -dioxin, and has greater sensitivity for protein bound hapten.

78-0959. Saleh, F. Y. ; Lee, G. F. (Environ. Sci., Univ. Texas Dallas, Richardson, TX 75080) **Analytical methodology for Kepone in water and sediment.** *Environ. Sci. Technol.* 12(3): 297-301; 1978. (10 references)

An analytical procedure for the determination of Kepone in water and sediment is described. The method adapts the regular, multiresidue procedure for the common chlorinated hydrocarbon pesticides and PCB's for the determination of Kepone. After elution of the common chlorinated hydrocarbon pesticides and PCB's from the Florisil column, Kepone is eluted using 200 ml of a solvent mixture consisting of 10% methanol and 5% benzene in hexane. This solvent mixture also produces consistent response of the electron capture detector to Kepone. The lower detection limit in water is 20 ng/l, and in sediment is 10 μg/kg. Average recovery of Kepone in sediments spiked with 4 mg/kg is 103%. (Author abstract reprinted by permission of the American Chemical Society)

78-0960. Gorbacheva, N. A. (Sci. Res. Inst. Forensic Med., Moscow, USSR) **Obnaruzhenie metafosa, metilnitrofosa i metiletiltiofosa pri sudebnokhimicheskom analize. [Detection of metaphos, methylnitrophos and methylethylthiophos at forensic analysis.]** *Farmatsiya (Moscow)* 26(6): 67-68; 1977. (4 references) (Russian)

A TLC method for the identification and quantitative determination of metaphos, methylnitrophos and methylethylthiophos in cadaveric material is described. Following extraction with hexane and reextraction with dimethylformamide followed by hexane, the sample is cleaned on activated silica gel KSK layer with benzene. The spots are visualized with palladium reagent, scraped off, eluted with a hexane-acetone mixture, and reapplied to silica gel KSK for quantitative determination against reference samples, using benzene as the solvent. The spots are visualized by means of palladium, bromophenol or Stenersen's reagents, or NaOH solution. The limit of detectability is lowest with Stenersen's reagent: 65 μg for metaphos, 100 μg for methylnitrophos, and 70 μg for methylethylthiophos.

78-0961. Davidek, J. ; Nemethova, M.; Seifert, J. (Dep. Food Chem. Anal., Prague Inst. Chem. Technol., CS-16628 Praha, 6, Czechoslovakia) **Indirect polarographic determination of phosmet O,O-dimethyl -S- (phthalimidomethyl)dithiophosphate** *Fresenius Z. Anal. Chem.* 287(4/5): 286-287; 1977. (12 references)

An indirect polarographic method for the determination of phosmet was elaborated. It is based on the fact that N-hydroxymethylphthalimide formed by the reaction of phosmet with sulfuric acid is polarographically active and exhibits a behavior during electrolysis at a Hg dropping-electrode similar to that of phthalimide. The method has been applied to the determination of phosmet in apples. The sensitivity is 0.1 ppm. (Author abstract by permission)

78-0962. Haumesser, W. ; Gerlach, W.; Roeder, C.-H. (Zentr. Anal. Pflanzenschutz Galvanotech., Schering AG Berlin Bergkamen (Werk Wolfenbuettel), D-3340 Wolfenbuettel, Germany) **Zur direkten massanalytischen Bestimmung von Carbamaten als sehr schwache Saeuren. [Direct volumetric determination of carbamates as very weak acids.]** *Fresenius Z. Anal. Chem.* 287(4/5): 291-295; 1977. (10 references) (German)

A method is presented for the direct determination of very weak acid carbamates. Determination is done by potentiometric titration with commercial tetra-n- butylammonium hydroxide solution diluted with propanol-(2). Glass indicator Ag/AgCl electrodes were used for the determination. The titration curves obtained permit correct calculation. It was possible to determine promecarb, bendiocard, carbaryl, formetanat-HCl, phenmedipham, desmedipham, phenyl-N- (3-tolyl)carbamate, methyl-N- (3-acetoxyphenyl) carbamate, and oxycarboxin by this method at an average standard error of 0.2-1%.

78-0963. Iurovskaia, E. M. (A. N. Marzeev Sci. Res. Inst. Gen. Communal Hyg., Kiev, USSR) **Degidrogenaznaia aktivnost bakterii kak test dlia otsenki toksichnosti khimicheskikh veshchestv. [Dehydrogenase activity of bacteria as a test for assessing the toxicity of chemical substances.]** *Gig. Sanit.* (12): 69-72; 1977. (6 references) (Russian)

A bacterial dehydrogenase test for the assessment of toxicity of chemical substances is described. *Escherichia coli* cultures are incubated at 37°C for 2 hr in the presence of glucose, triphenyltetrazolium chloride and the substance to be tested. The toxicity of the substance is assessed from the inhibition of the *E. coli* dehydrogenase activity, determined by the amount of formazan formed. Formazan is measured photocolorimetrically at 490 nm. Tests with trichlorfon in concentrations of 0.5-5 g/l showed significant reduction of the dehydrogenase activity. A comparison with other methods, based on bacterial counts and survival rates in cultures incubated with trichlorfon, shows the *E. coli* dehydrogenase test to be more sensitive than other methods in assessing the toxicity of toxic substances.

78-0964. Ludwick, A. G. ; Lau, A. N. K.; Ludwick, L. M. (Dep. Chem., Tuskegee Inst., Tuskegee Institute, AL 36088) **Simple sensitive technique for detecting organochlorine pesticides on thin layer chromatograms.** *J. Assoc. Off. Anal. Chem.* 60(5): 1077-1080; 1977. (11 references)

Chlorinated hydrocarbon pesticides can be quickly detected using commercially available thin layer chromatographic plates dipped in an acetone solution of silver nitrate. The limits of detection are functions of the pesticide, adsorbent, developing system, and concentration of the silver nitrate in acetone solution. On exposure to ultraviolet light, 0.002 μg 2,4,5-T produced clear darkening within 30 min on precoated silica gel plates (polyvinyl alcohol binder) coated with a solution of 0.1% silver nitrate in acetone. For this system, a 60 min detection period was necessary for a 0.05% coating solution. On the silica gel plates (polyvinyl alcohol binder, 0.1% silver nitrate), 0.02 μg lindane is detected within 75 min. For alumina plates (polyvinyl alcohol binder, 0.1% silver nitrate), 0.025 μg aldrin is detected within 10 min. Darkening of this plate prohibits the detection of 0.012 μg aldrin. On silica gel plates (polyvinyl alcohol binder, 0.1% silver nitrate), 0.015 μg aldrin can be detected within 45 min. The method described provides sensitivities equal to or exceeding literature values. (Author abstract by permission)

78-0965. Van Auken, O. W. ; Hulse, M. (Div. Allied Health Life Sci., Univ. Texas San Antonio, San Antonio, TX 78285) **Extraction and gas-liquid chromatographic determination of hexachlorophene from several plant tissues.** *J. Assoc. Off. Anal. Chem.* 60(5): 1081-1086; 1977. (20 references)

Conditions are described for extraction, cleanup, derivatization, detection, and quantitation of hexachlorophene (HCP) residues from several types of plant material. Wet plant tissue was homogenized and extracted with ethyl ether, dried, and methylated with excess diazomethane. Samples were precleaned by column chromatography on silica gel with benzene-petroleum ether (1 + 1), and then 1-10 μl concentrated sample was chromatographed on a 6′ column of 3% SE-30 on 80-100 mesh Gas-Chrom Q. The detection limit for the electron capture detector was < 0.1 ng dimethoxy hexachlorophene and 1 ppb HCP in plant tissue. Recoveries (%) of 11-610 ppb HCP added to tissue averaged 94.3 for tomatoes, 86.4 for green peppers, 92.6 for cucumbers, 93.3 for green beans, 93.7 for peanut hay, and 91.6 for peanut shells. (Author abstract by permission)

78-0966. Van Auken, O. W. ; Hulse, M.; Durocher, C. L. (Div. Allied Health Life Sci., Univ. Texas San Antonio, San Antonio, TX 78285) **Extraction, gas-liquid chromatographic detection and quantitation of hexachlorophene residues from plant tissues high in lipid content.** *J. Assoc. Off. Anal. Chem.* 60(5): 1087-1092; 1977. (20 references)

A method has been developed for the extraction, cleanup, derivatization, detection, and quantitation of hexachlorophene (HCP) residues from 2 types of plant storage tissue high in lipid content. Wet soybean or peanut tissue was homogenized and extracted with ethyl ether and chromatographed on silica gel to remove the neutral lipids. The cleaned up sample was methylated with diazomethane and the dimethoxyhexachlorphene was eluted from a second silica gel column and chromtographed on a 6′ glass column packed with 3% OV-1 or 3% SE-30 on Gas-Chrom Q. The instrument detection limit for the ^{63}Ni electron capture detector was < 0.1 ng for dimethoxyhexachlorophene and about 1 ppb for HCP residue in plant issue. Recovery of 10-420 ppb HCP added to tissue averaged 90.9±5.7%. Interfering substances were removed, column life was increased, peak sharpness was increased, and tailing of the parent compound was decreased by using appropriate column chromatography. (Author abstract by permission)

78-0967. Rangaswamy, J. R. ; Prakash, S. R.; Vijayashankar, Y. N. (Infest. Control Pestiv. Div., Cent. Food Technol. Res. Inst., Mysore 570013, India) **Spectrophotometric determination of methomyl residues in selected vegetables, grains, and soil.** *J. Assoc. Off. Anal. Chem.* 60(5): 1093-1096; 1977. (5 references)

Methomyl (*S*-methyl-*N*-[(methylcarbamoyl)oxy] thioacetimidate) is converted to oxime and hydroxylamine by alkali and acid treatment, respectively. Hydroxylamine is oxidized with iodine in the presence of sulfanilic acid to yeild *p*-diazoniumbensenesulfonic acid which is coupled with α -naphthylamine to form a crimson *p*-benzenesulfonic acid-azo-α-naphthylamine with an absorption maximum at 520 nm. The relationship between absorbance and concentration of methomyl is linear in the range 0.5-10 μg. The method is sensitive and specific; 0.625 ppm methomyl can be determined in a 40 g sample of selected vegetables, grains, and soil. (Author abstract by permission)

78-0968. Aspila, K. I. ; Carron, J. M.; Chau, A. S. Y. (Water Qual. Branch, Inland Waters Direct., Burlington, Ont. L7R 4A6, Canada) **Interlaboratory quality control study of the analysis of water for pesticides.** *J. Assoc. Off. Anal. Chem.* 60(5): 1097-1104; 1977. (10 references)

An interlaboratory quality control study was conducted to provide information to 5 participating Canadian laboratories on their capability in analyzing natural waters

for 10 pesticides. The study was designed to identify the quality of each laboratory's working standards for 15 organochlorine pesticides, and the accuracy and precision of each laboratory's analytical procedures. Fifteen samples were provided, of which 3 were standards prepared for direct injection into an electron capture gas chromatograph. Instructions were provided to use these 3 standards for quantitating the pesticide content (8-150 ng/L) in 5 pairs of 1 L water samples. These paired samples contained 10 organochlorine pesticides approaching natural levels. Results of the study indicated that participants were fairly precise and achieved the designed ratio 1.5 for concentrations in the paired samples. (Author abstract by permission)

78-0969. Onley, J. H. ; Giuffrida, L.; Ives, N. F.; Watts, R. R.; Storherr, R. W. (Regist. Div., US EPA, Washington, DC 20460) **Gas-liquid chromatography and liquid chromatography of ethylenethiourea in fresh vegetable crops, fruits, milk, and cooked foods.** *J. Assoc. Off. Anal. Chem.* 60(5): 1105-1110; 1977. (6 references)

The Onley-Yip procedure for determining ethylenethiourea (ETU) in milk and crops was modified to reduce interferences by the ethylenebisdithiocarbamates (EBDC's). A 20 g crop-methanol extract is cleaned up by adsorbing the sample onto Gas-Chrom S, desorbing ETU, and eluting ETU from aluminum oxide with chloroform containing ethanol. ETU is converted to the *S*-butyl derivative for gas-liquid chromatography (GLC) and flame photometric detection (sulfur mode). For liquid chromatography (LC), ETU is cleaned up on another aluminum oxide column and injected directly. LC and GLC results are confirmed by thin layer chromatography. A cooking procedure based on conversion of EBDC's to ETU is included for surveying crops for possible EBDC content. Recoveries from 8 crops and milk fortified at 0.05 ppm ETU ranged from 73 to 100%. (Author abstract by permission)

78-0970. Onley, J. H. (Regist. Div., US EPA, Washington, DC 20460) **Gas-liquid chromatographic method for determining ethylenethiourea in potatoes, spinach, applesauce, and milk: collaborative study.** *J. Assoc. Off. Anal. Chem.* 60(5): 1111-1115; 1977. (6 references)

Eight laboratories collaboratively tested a gas-liquid chromatographic method for determining ethylenethiourea (ETU) in potatoes, spinach, applesauce, and milk. In the determinative step, ETU is converted to the *S*-butyl derivative (2-*n*-butylmercapto-2-imidazoline) which is detected by a flame photometric detector, sulfur mode. For unknown fortification levels of 0.06, 0.12, and 0.30 ppm the collaborators reported an overall average recovery range of 85-97% in the various commodities. The method has been adopted as interim official first action. (Author abstract by permission)

78-0971. Grimes, G. S. (Purdue Univ., Indiana State Chem. Off., W. Lafayette, IN 47907) **Gas-liquid chromatographic determination of fluchloralin in formulations.** *J. Assoc. Off. Anal. Chem.* 60(5): 1145-1147; 1977. (2 references)

A gas-liquid chromatographic (GLC) method has been developed that is precise, rapid, simple, and specific for fluchloralin in emulsifiable liquid formulation. Sample and reference standard are weighed, internal standard solution is added, and an aliquot of the mixture is injected onto the chromatographic column. Fluchloralin gives a sharp symmetrical peak at about 5.4 min. The internal standard has a broader symmetrical peak at about 6.9 min. The relative standard deviation for 21 consecutive injections of the standard solution was 0.3773%. The method was compared with the official GLC method, 6.210-6.215, for the structurally similar trifluralin. Fluchloralin gave a sharp symmetrical peak at about 8.5 min; the internal standard had a sharp symmetrical peak at about 9.2 min. The relative standard deviation of 21 consecutive injections of reference standard solution was 0.6988%. Comparison of the variances of the 2 methods by the *F*-test at the 99% confidence level showed that the proposed method demonstrated substantially better precision. (Author abstract by permission)

78-0972. Stiles, A. R. ; Miles, J. W.; Wayne, R. S.; Newton, L. H. (Vector Biol. Control Div., WHO, CH-1211 Geneva 27, Switzerland) **Nonaqueous copper colorimetric and silver titrimetric methods for determining malathion in technical grade malathion and malathion formulations from domestic and foreign sources: interlaboratory study.** *J. Assoc. Off. Anal. Chem.* 60(5): 1148-1153; 1977. (4 references)

The nonaqueous copper colorimetric and the silver titrimetric methods for determining malathion were studied. Samples of technical grade malathion and emulsifiable concentrates from 4 countries and samples of water-dispersible powders from 3 countries were used in the study. Nineteen participants in 15 laboratories representing 11 countries took part in the study. The precision obtained within laboratories was excellent. Agreement among laboratories was also quite good with coefficients of variation ranging from 1.05 to 5.31 for the silver method and from 0.65 to 3.52 for the copper method. Results by both methods were high when compared with results obtained by gas-liquid chromatography. This was particularly true for poor quality samples. (Author abstract by permission)

78-0973. Agemian, H. ; Chau, A. S. Y. (Water Qual. Branch, Canada Cent. Inland Waters, Burlington, Ont. L7R 4A6, Canada) **Analysis of pesticide residues by chemical derivatization. V. Multiresidue analysis of eight phenoxyalkanoic acid herbicides in natural waters.** *J. Assoc. Off. Anal. Chem.* 60(5): 1070-1076; 1977. (24 references)

A multiresidue method is presented for the gas-liquid chromatographic determination of phenoxyalkanoic acid herbicides in natural waters. Extraction efficiencies of different organic solvents are considered in developing a solvent extraction scheme for these herbicides from water. Reactions for derivatizing these compounds by using pentafluorobenzyl bromide, boron trichloride-2- chloroethanol, and dicyclo hexylcarbodiimide -2- chloroethanol were studied in order to

obtain extracts with low blanks to provide the lowest detection limits. Advantages and disadvantages of the 3 methods are discussed. Retention times are twice as long for the pentafluorobenzyl (PFB) esters as for the 2-chloroethyl (2-Cl) esters under the same conditions, although electron capture sensitivity to the former was greater. The PFB esters are easier to form, but the 2-Cl reaction is more specific for these herbicides. Solutions from the boron trichloride reaction gave the cleanest blanks. (Author abstract by permission)

78-0974. Veierov, D. ; Aharonson, N. (Pestic. Chem. Residue Res. Lab., Volcani Cent., Agric. Res. Organ., Bet Dagan, Israel) **Simplified fat extraction with sulfuric acid as cleanup procedure for residue determination of chlorinated hydrocarbons in butter.** *J. Assoc. Off. Anal. Chem.* 61(2): 253-260; 1978. (12 references)

A new cleanup procedure is described for chlorinated hydrocarbon residues in butterfat. The method is based on the dropwise addition of H_2SO_4 to a fat solution column and continuous removal of the lipids and the acid. The cleanup of 0.25-2.0 g fat requires only 10-40 ml sulfuric acid and 12-17 ml petroleum ether. There is no need for any further cleanup step, solvent evaporation, or centrifugation. The method is easy to standardize and is suitable for automation. At least 30 fat samples can be cleaned up manually by one analyst in one day. Recoveries were complete (> 90%) for polychlorinated biphenyl compounds and for 13 chlorinated pesticides of 16 examined. The method was tested on chlorinated hydrocarbon residues in commercial butter and the results were compared with those obtained with the acetonitrile method. The versatility and limitations of the method were investigated by varying the sulfuric acid strength, initial fat solution concentration, and column dimensions. (Author abstract by permission)

78-0975. Carlstrom, A. A. (Chevron Chem. Co., Richmond, CA 94804) **High pressure liquid chromatography of Folpet in formulations: collaborative study.** *J. Assoc. Off. Anal. Chem.* 60(5): 1157-1163; 1977. (28 references)

A simple, rapid method is described for measuring folpet, specifying ultraviolet (UV) detection after high pressure liquid chromatographic separation in a 30-cm by 4 mm column packed with 10 μm diameter silica gel. Formulations are extracted with methylene chloride which contains dibutyl phthalate as an internal standard. After inert materials are precipitated, the supernate is added directly to the column, and the compound is quantitated by peak height ratios. Most pesticides commonly formulated with folpet do not interfere, nor do the related compounds captan and captafol. Retention times and UV response factors relative to folpet are listed for the pesticides most commonly formulated with folpet. Sixteen collaborators made single determinations on 6 samples. The average coefficients of variation were 0.95% for the 2 technical samples, 1.77% for the 2 50% wettable powders, and 1.12% for the 2 5% dusts. No systematic error was detected. The method has been adopted as official first action. (Author abstract by permission)

78-0976. Luckas, B. ; Pscheidl, H.; Haberland, D. (Inst. Hyg., DDR-25 Rostock, DDR) **Determination of chlorinated pesticides and polychlorinated biphenyls by derivatization gas chromatography.** *J. Chromatogr.* 147: 41-46; 1978. (31 references)

The determination of chlorinated pesticides and polychlorinated biphenyls (PCB's) in environmental samples is rapidly and efficiently achieved by the simultaneous use of GLC and derivatization gas chromatography. The method is based on the different stabilities of chlorinated pesticides and PCB's towards magnesium oxide in a microreactor. Extracts of samples are injected twice, first into a regular gas chromatograph and then into a gas chromatograph equipped with a microreactor for derivatization. A "basic" chromatograph and a "derivatization" chromatogram are obtained and the combination of the two chromatograms provide a satisfactory solution. (Author abstract by permission)

78-0977. Wolff, G. ; Ebing, W. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanst. Land Forstwirtsch., D-1000 Berlin, Germany) **Eine methode zur einheitlichen Reinigung und Bestimmung von Chlorkohlen wasserstoffinsektizi drueckstaenden in verschiedenen Getreidearten. [Method for uniform clean-up and determination of organochlorine insecticide residues in several cereals.]** *J. Chromatogr.* 147: 213-219; 1978. (14 references) (German)

Gel filtration on Sephadex LH-20 in ethanol was shown to be a suitable method for the clean-up of aldrin, hexachlorobenzene, α-, β-, γ- and δ-hexachloro cyclohexane at a residue level of 0.01 mg/kg, and *p,p'*-DDE, *o,p'*-DDT and *p,p'*-DDT at a residue level of 0.02 mg/kg from barley, maize, rice, rye and wheat. This clean-up procedure includes a step involving sulfuric acid treatment. Insecticide recoveries were checked simultaneously by gas chromatography using a ^{63}Ni electron-capture detector. The recovery of the insecticides ranged from 73 to 99%. The method described may be applicable to the routine determination of the above organochlorine insecticides in these cereals. (Author abstract by permission)

78-0978. Kapila, S. ; Aue, W. A. (5637 Life Sci. Cent., Dalhousie Univ., Halifax, N. S., Canada) **Chemical degradation of single, gas chromatographic peaks for confirmation of pesticide residue identity.** *J. Chromatogr. Sci.* 15(12): 569-572; 1977. (4 references)

Confirmation methods are needed in pesticide residue analysis. A chromatographic confirmation technique compatible with GLC with electron capture detection was studied. The sample is separated by the first column and a small fraction of it is monitored by electron capture detection. The remainder is doped with hydrogen and normally exhausted. When the peak of interest elutes from the first column, this stream is directed to a reactor containing a nickel wire catalyst. The reaction products are separated on a second column and detected by a second electron capture detector. Successful analysis for hexachlorobenzene despite the presence of the interferents Aroclor 1240 and Halowax 1013

indicates the method's potential as a confirmation technique in analysis for pesticide residues. Clear product patterns were obtained from other chlorine-containing aliphatic insecticides when appropriate lower reactor temperatures were used.

78-0979. Loos, M. A. ; Kearney, P. C. (Dep. Plant Pathol. Microbiol., Univ. Natal, Pietermaritzburg, South Africa) **Thin-layer and paper chromatography of potential degradation products of *s*-triazine herbicides.** *J. Chromatogr. Sci.* 16(2): 86-89; 1978. (17 references)

This paper reports the procedures and results of TLC and paper chromatography studies and discusses problems encountered with the hydroxy-*s*-triazines during chromatographic procedures. TLC and paper chromatography of ^{14}C-labeled cyanuric acid, ammelide, ammeline, *N*-ethylammelide, *N*-ethylammeline, and hydroxysimazine are reported. Solvent systems contained a nonacidic organic solvent, acetic acid, and water. Relationships between molecular structure of the triazine compounds and chromatographic mobility are evident. Replacement of one or two hydroxyl groups of cyanuric acid or one of *N*-ethylammelide with amino groups resulted in decreased thin-layer mobility. Substitution of one or both amino group of ammeline or the amino group of ammelide with an ethyl group caused increased mobility. On paper chromatograms similar trends were not except that replacement of the second hydroxyl of cyanuric acid or an *N*-ethylammelide hydroxyl with an amino group caused a slight increase in mobility.

78-0980. Krasnykh, A. A. ; Shvets, D. A. (All-Russian Sci. Res. Inst. Plant Prot., USSR) **Khromatograficheskoe opredelenie pirimora v vode i pochve. [Chromatographic determination of pirimor in water and soil.]** *Khim. Sel'sk. Khoz.* 15(12): 37-39; 1977. (Russian)

A TLC method for the determination of pirimor (pirimicarb, 2-dimethylamino- 5,6-dimethylpyrimidyl- 2-*N,N* -dimethylcarbamate) in water and soil is described. Following extraction with chloroform, dehydration and vacuum concentration, the determination is performed using equal parts of benzene and chloroform as the solvent system. The spots are visualized with ninhydrin, Dragendorff's reagent, or UV irradiation. Quantitative determination is done by visual comparison of the color or luminescence intensity and spot size against reference solutions. The sensitivity amounts to 0.02-0.05 mg/kg; the recovery rate is 80-86%.

78-0981. Fateeva, O. F. ; Popova, V. A. (Kazakh Sci. Res. Inst. Plant Prot., USSR) **Khromato-enzimnyy metod razdel'nogo opredeleniya fozalona i ego metabolitov v plodakh i list'yakh yabloni. [Enzymatic-chromatographic method for determining phosalone and its metabolites in apple leaves and fruit.]** *Khim. Sel'sk. Khoz.* 16(1): 64-67; 1978. (6 references) (Russian)

A TLC-enzymatic method for the detection and separate quantitative determination of phosalone and its metabolites in apples and apple tree leaves is described. Following extraction with chloroform, phosalone is separated from its metabolites on a silica gel plate, using hexane-acetone in a 4:1 ratio as the solvent system. The metabolites appear with *Rf* values of 0, 0.2, 0.35 (possibly hydroxymethyl-6- chlorobenzoxazolone) and 1, while phosalone has an *Rf* of 0.5. The enzymatic determination is done after elution of the spots by determining the cholinesterase inhibiting activity with acetylcholine and bromthymol blue, using equine serum as the substrate. The phosalone content and its toxicity are determined by measuring the color change of the solution. Quantitative determination is done against calibration curves. The sensitivity of the method amounts to 0.5 μg in the sample. Determinations in apples revealed that phosalone accounted for 61% of the overall inhibiting activity on the day of treatment, for 38% after 10 days, and for only 1.4% after 60 days, at which time the metabolites with *Rf* 0, 0.2, 0.35 and 1 accounted for 23.1%, 13.3%, 55% and 7.2%, respectively.

78-0982. Gvozdikova, L. G. (Ukr. Sci. Res. Inst. Canning Ind., USSR) **Khromatograficheskiy sposob opredeleniia soderzhaniya pestitsida gardona v rastitel'nom syr'e i konservakh. [Chromatographic determination of gardona in fresh and canned produce.]** *Konservn. Ovoshchesush. Promst.* (12): 34-36; 1977. (Russian)

A TLC method for the determination of gardona (chlorfenvinphos) in plant material and canned produce is described. The pesticide is extracted with hexane. The extract obtained from canned produce is filtered through gauze. Determination is done on Silufol plates against reference samples, using ethyl acetate and hexane (1.5:2) as the solvent system. The spots are visualized in UV light after the plates have been sprayed with an aqueous acetone solution of silver nitrate and ammonia. The *Rf* value is 0.47±0.01. Trials revealed a precision of 81.1±2.6%, a sensitivity of 0.06-0.12 mg/kg, and a recovery rate of 88.7-101%.

78-0983. Pavlou, S. P. ; Hom, W. (Univ. Washington, Dep. Oceanogr., Seattle, WA) **Interlaboratory calibration results from chlorinated hydrocarbon analyses in marine sediments.** *Mar. Chem.* 4(2): 155-163; 1976. (12 references)

The reliability of measurements made in natural marine sediments of the concentrations of chlorinated hydrocarbons is assessed statistically for the various sample treatments and quantitative techniques used by ten different laboratories. The sediment samples to be studied were taken from Elliott Bay, Washington. The study demonstrated that preextraction handling of the sample significantly affected the results (extraction of dry sediments yielded the highest recovery) while differences in cleanup procedures did not influence the data. Although PCB's were measrued by three different methods, the homolog approach can account for the changes of individual components in the sediment. To obtain the best estimate, it is recommended that the samples should be dried prior to solvent extraction and that results should be reported as homolog components.

78-0984. Suzuki, T. (Fac. Agric., Tohoku Univ., Sendai, Miyagi, Japan) **[Principle and application of mass fragmentography (MF) in the analysis of pesticides.]** *Nippon Noyaku, Gakkashi (J. Pestic. Sci.)* 2(Suppl.): 587-588; 1977. (Japanese)

The principle of mass fragmentography was discussed. In a mass spectrograph connected to a gas chromatograph, when the strength of the magnetic field and the accelerating voltage are kept constant, a gas chromatogram of a predetermined mass number is obtained (MF). For instance, bromacil, a herbicide, was affected by contaminants in ordinary gas chromatograhy with ECD. However, when it was analyzed by MF using a mass number of 205 (m/e), a successful analysis could be conducted at the ppb level without any effect of contaminants. The same method was applied to the determination and identification of decomposition compounds of chlorothalonil (tetrachloroisophthalonitrile).

78-0985. Kato, S. ; Komatsu, K.; Morishita, K.; Matsunaga, Y. (Jpn. Food Anal. Ctr., Tokyo, Japan) **[Method for determination of residues of linuron and diuron on/in crop plants.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 2(Suppl.): 589-590; 1977. (Japanese)

A highly sensitive method for determining residues of linuron and diuron on/or in crop plants has been established, wherein the residue is hydrolyzed to form 3,4-dichloroaniline, which is then chloroacetylated with anhydrous monochloroacetic acid. Then the derivative is determined by GLC with ECD. Extraction from the specimen was performed with aqueous acetone, and the extracted substance was transferred to hexane. Then, after partitioning between hexane and acetonitrile, the liquid was purified by column chromatography with activated Florisil. The isolated active ingredient was hydrolyzed with 6 *N* hydrochloric acid to form the chloroaniline. Chloroacetylation was performed in a 10% benzene solution of anhydrous monochloroacetic acid, shaken for 5 min. The recovery was 74-94%, and the detection limit was 0.005 ppm. The crops used were soybean, Welsh onion, maize, carrot, peach, etc.

78-0986. Sato, R. ; Tokieda, M. (Sch. Agric. Chem., Faculty Agric., Tokyo Univ. Agric., Technol., Tokyo, Japan.) **[Method for determination of linuron and diuron residues.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 2(Suppl.): 590; 1977. (Japanese)

In the method of determining linuron and diuron hydrolysis, chloroacetylation, and GLC steps were examined. The best conditions for hydrolyzing linuron were: 1-3 *N* alchoholic potassium hydroxide, and refluxing at 90°C for 45-60 min; the rate of hydrolysis is then nearly 100%. The best conditions for hydrolyzing diuron were: 6 *N* hydrochloric acid, 90°C. 45-60 min; the rate of hydrolysis is nearly 100%. The best conditions for chloroacetylation were: using monochloroacetyl chloride or triethlamine in hexane, at 25°C for 20 min or at 30-60°C.for 10 min. The rate of reaction was 100%. The best conditions for GLC were: column, 3 mm x 2 m; temperatures of column and evaporating chamber, 200 and 240°C.; carrier pressure 2.0 kg/cm^2 of nitrogen, liquid of stationary layer of 5% XE-60/Diaport S. The minimum detectable amount was 0.03 ng for linuron and 0.01 ng for diuron. The limit of detection in residue analysis was 0.003 ppm from potato and peanut; the recovery was 97% from potato and 90% from peanut for linuron. The detection limit of diuron was 0.01 ppm in apple and Chinese cabbage, and the percentage of recovery was 78% in apple and 83% in Chinese cabbage.

78-0987. Metelev, V. V. ; Brichko, V. F. (All-Union Sci. Res. Inst. Vet. Hyg., USSR) **Opredelenie yalana i propanida v vode i rybe. [Determination of yalan and propanide in water and fish.]** *Veterinariya (Moscow)* (9): 106-108; 1975. (4 references) (Russian)

A GLC method for determining yalan (molinate) and propanide (propanil) in water and fish and studies on the residue dynamics of these pesticides in water and fish are reported. Threefold extraction with ethyl acetate or butyl acetate is used to extract yalan from fish; ethyl acetate or hexane is used for extraction from water. The recovery rate is 72.8% from fish and 75.9% from water. The sensitivity of the GLC determination amounts to 0.05 mg/kg in fish and 0.01 mg/l in water, but it can be improved to 0.005 mg/kg and 0.001 mg/l, respectively. Propanide is extracted from fish and water with ethyl acetate. The sensitivity amounts to 0.01 mg/kg and it can be lowered to 0.001 mg/kg. Shallow ponds were treated with yalan (10 kg/ha) and propanide (5 kg/ha). The yalan residues in the water dropped from 5.1 mg/liter on the first day to 0.01 mg/l on the thirtieth; the residues in carp dropped from 3.41 mg/kg on the second day to trace amounts on the twentieth day. The residue levels measured on the seventh day were highest in the skin (0.81 mg/kg), gills (0.412 mg/kg), and viscera (0.385 mg/kg), and lowest in the muscles (0.214 mg/kg). The propanide residues found in the water were 0.558 mg/l on the first day and 0.0093 mg/l on the seventeenth; the residues found in the carp were 0.44 mg/kg on the second day and 0.01 mg/kg on the fourteenth. The concentrations were highest in the parenchymatous organs (brain, spleen, liver, kidneys) ranging from 4.5 to 8.8 mg/kg. A metabolite of propanide, 3,4-dichloroaniline, appeared in the water on the fourth day, and later also in the carp spleen and intestines. Yalan showed no cumulative properties. The findings indicate that fish grown on rice fields are fit for consumption 30 days after treatment with yalan and 15 days after treatment with propanide.

78-0988. Thielemann, H. (Hyg. INst. Martin Luther Univ. Halle Wittenberg, DDR-402 Halle, DDR) **Experimentelle Untersuchungen zur duennschichtchromatographischen Trennung und Identifizierung von Rueckstaenden - polychlorierte Biphenyle (PCB) und *p,p'*-DDE - in Lebensmitteln. [Experimental studies on TLC Separation and Identification of polychlorinated biphenyls (PCBs) and *p,p'*-DDE in foods.]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 23(12): 935; 1977. (German)

A TLC method for the separation and identification of PCB and *p,p'*-DDE residues in foods is described on the basis of a model experiment. Kieselguhr G plates were ac-

tivated at 110°C. Acetonitrile: acetone:methanol: water (40:-18:40:2) was the solvent system. Ammoniacal silver nitrate solution was used for development in UV light. The method enabled clear separation of an artificial mixture of *p,p'*-DDE and chlorphen A50.

78-0989. Hild, J. ; Thier, H. P. (Inst. Lebensm., Univ. Muenster, D-4400 Muenster, Germany) **Thioaether, Sulfoxide und Sulfone von Organophosphor-Pesticiden in Pflanzenmaterial. [Residue analysis of plant material for organophosphorus pesticides with thioether groups including their sulphoxides and sulphones.]** *Z. Lebensm. Unters. Forsch.* 166(1): 9-12; 1978. (4 references) (German)

When food obtained from plants is analyzed for organophosphorus pesticides that contain thioether groups, analysis for the corresponding sulfoxide and sulfone metabolites should be included. The proposed analysis method consists of a simple clean-up of the extracts followed by an oxidation step in which potassium permanganate is used. Gas-liquid chromatography and alkali flame thermionic detection are used to measure sulfone formation.

78-0990. Stan, H. J. (Inst. Lebensm.,Tech. Univ. Berlin, D-1000 Berlin 12, Germany) **Nachweis von Organophosphorsaeureester - Rueckstanden in Lebensmitteln im PPB-Bereich durch Capillargaschromatographie- Massenspektrometrie- Kopplung. [Detection of organophosphorus pesticide residues in food at the ppb level with open tubular column gas chromatography mass spectrometry.]** *Z. Lebensm. Unters. Forsch.* 164(3): 153-159; 1977. (10 references) (German)

Open tubular column gas chromatography was combined with mass spectrometry and a computer to identify residues of organophosphorus pesticides in food. A 20-m SE-54 glass capillary column was used to separate 21 common organophosphorus pesticides. Phosphamidon and fenchlorphos could not be distinguished from each other. Individual pesticides were identified using chemical ionization mass spectrometry (CIMS) with isobutane and computerized background subtraction. By comparing CIMS dibrom, demeton-S-methyl, mevinphos, diazinon, dimethoate, bromophos, parathion, fenthion, methidathion, and azinphos-ethyl in cherries were detected at residue levels of 0.45 ppm. Concentrations of 40 ppb of these pesticides in cherries were unequivocally identified by mass fragmentography with ion detection. When CIMS was used with isobutane, the detection limit in food extracts was in the lower ppb region. The integrated computer system made it possible to determine all 10 of these pesticides in one GC run. It was possible to obtain a considerably lower detection limit using chemical ionization than by electron impact.

78-0991. Zhemchuzhin, S. G. ; Grigorchuk, N. A.; Matyukhina, E. N.; Chvertkin, B. Ya.; Sokolova, G. D. (All-Union Sci. Res. Inst. Phytopathol., Moscow, USSR) **Fotometrickeskiy metod opredeleniya sistemnogo fungitsida benomila. [Photometric determination of the systemic fungicide benomyl.]** *Zh. Anal. Khim.* 32(12): 2421-2423; 1977. (8 references) (Russian)

Photometric method for the quantitative determination of benomyl in the submilligram range is described. Benomyl is nitrated with ammonium nitrate, the nitro derivative is extracted with ethyl ether, and determined photometrically after the addition of sodium ethylate and acetone as chromogenic reagents according to the Janovsky reaction.

See also **78-0716, 78-0719,** *and* **78-0795.**

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